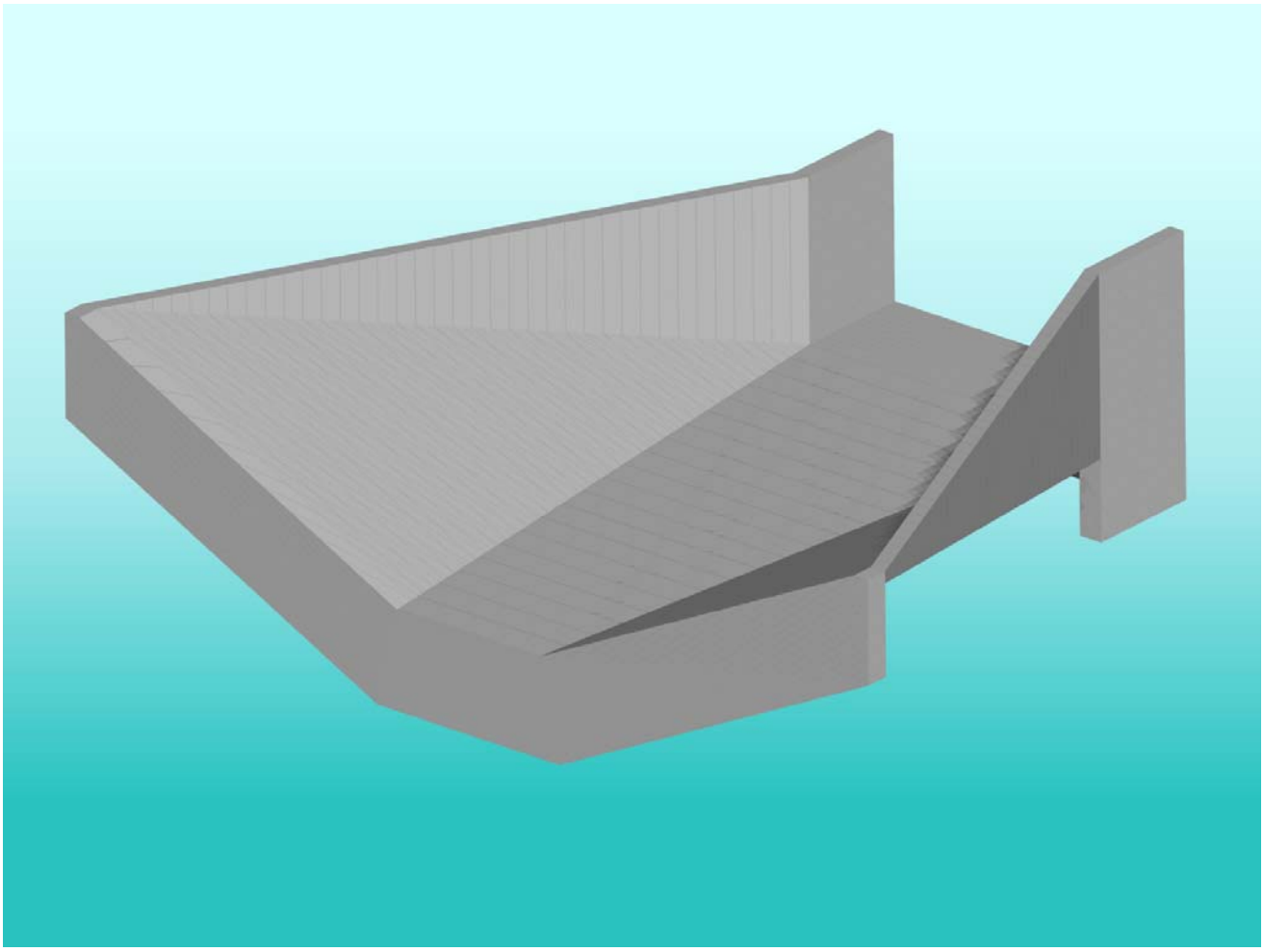
New Mexico Drafting Guidance

January 2005



FOREWORD

This document has been prepared to assist you in the preparation of CAD drawings. The information herein does not replace the New Mexico Drafting Manual, which was developed prior to the advent of computer-assisted drawings.

The intent of the New Mexico Drafting Guidance is to identify methods, techniques, and properties to be used by all to simplify the sharing of drawings within the state and to maximize the uniformity of drawings. Questions will arise that are not covered in this guidance, as there are many small details that could not be included. Such questions can be directed to members of the State Design Unit in the New Mexico State Office.

It is suggested that the Drafting Manual and the Drafting Guidance be kept as a ready reference for all offices where construction drawings are prepared. Revisions and or additions of the Drafting Manual are not anticipated. Revisions of the Drafting Guidance will be issued via e-mails as changes warrant.

REFERENCES INCLUDED

- National Engineering Manual (NEM) Part 541, Drafting, (210-541)

REFERENCES NOT INCLUDED

- TR-73 Computer-Aided-Drafting Standards
- Engineering Field Manual (EFM) Chapter 5, Part 3
- National Engineering Handbook (NEH) Part 6, Chapter 4.4, Detailing reinforced concrete structures
- General Manual (GM) Part 408, Records, (120-408)
- National Map Symbol Handbook, Title 170, Part 601
- NRCS Computer Aided Design (CAD) Standards and Guidelines
- Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315)
- AutoCAD® User's Guide
- CAD Digest Weekly (www.caddigest.com)

TABLE OF CONTENTS

OVERALL GUIDANCE
for
COMPUTER ASSISTED DESIGN AND DRAFTING (CADD)

Purpose

The purpose of this document is to establish the minimum standards necessary to ensure that the published drawings appear to have been prepared essentially by one drafter. In addition, the drawings are to be prepared in such a manner that any other drafter can copy and utilize certain features with the least number of changes possible.

Drawing Management

All construction drawings, design aids, charts and graphs are to reflect the assigned drawing number. The State Design Engineer will assign drawing numbers when requested in accordance with NM-ENG-252, Request for Engineering Services.)

All construction drawings are to have a title block when the drawing is first initiated. The title block is to be complete, with title, name of drafter, and current time and date. Sheet numbers need not be included until a rough index is prepared and a "control" set of drawings is initiated. The date and time is to be updated each time the drawing is saved. When a complete set of drawings is finished and ready for contracting, the date and time is not to be changed. Revisions are to reflect any changes after the drawings have been signed/sealed. All construction drawings are to be saved on an internal drive or an external drive at the end of each day. Backups are to be conducted weekly. When a file is retrieved from the system, the time and date in the title block is to be checked against that on the "redlined" check print to ensure that the drafter has retrieved the most current update of the sheet.

A **CAD Record** shall be included on each sheet and placed on the **cadrec** layer. This is a permanent record to document pen widths, plot factor, and drawing history. The **CAD Record** is to be updated by the draftsperson at the time the drawing is created or revised. The **cadrec** layer is to be left visible (ON) when the drawing is complete and ready for sharing or archiving. The following information is to be on the **CAD Record**:

Drafter's name
Work phone number
City, State
Sheet size
Named viewports
Additional comments
Software and Version
English or Metric units
Plotted inches = Units drawn (insert factor/scale)
Factor 1=

General

Construction drawings are an integral part of the contract documents. The combination of drawings, construction specifications, and material specifications is defined as "plans." The plans identify what work must be preformed, the materials to be furnished and quality of the finished product.

The drawings must be accurate, neat, legible and well organized. Show all dimensions, stations and elevations; identify all materials and items to be furnished. Define the work to be preformed by the contractor or by others. Place information in a logical order and avoid unnecessary repetition. Drafting shall be within ANSI D (size 22 x 34 inches) and plotted on a sheet size that is 24" x 36" for all projects other than those associated with dairies. Drawings associated with dairy projects shall be

plotted on 11” x 17” stock to facilitate folding and storage within a normal size three-ring binder. The title block is to be along the right hand border.

Provision for approval signatures is made on the cover sheet and in the title block of all drawing sheets with the initials and full name of the designer, draftsperson and initials of checkers.

Where notes and abbreviations are used on several sheets, use identical words and abbreviations. Notes should be brief, positive statements. A note should convey the same information to all who read it. Long unwieldy sentences can become sources of conflict.

The construction drawings include several types of drawings:

1. Cover sheet
2. Maps
3. Plan of improvements (pond, dam, reservoir, borrow areas, structures, et cetera)
4. Profiles and cross sections
5. Structural details
6. Steel reinforcing details
7. Miscellaneous details
8. Geotechnical information

CAD drawings prepared in New Mexico shall be prepared using AutoCAD® software. The State Design Unit uses SurvCADD® software for the design component. Other design software may be used when the user’s AD-700 justification statement is approved by the procurement system.

All drawings and details will be drawn to **REAL WORLD DIMENSIONS**. This allows users to add details and/or symbols without having to manipulate the scale. This also allows users to print/plot on a standard drawing sheet to a given scale. For example, 1 plotted–inch: 100 drawing units means 1”:100’ if the drawing units are in feet. When drawing in real world dimensions, the line types may appear as continuous lines. The **LTSCALE** (lts) command will generally need to be changed from the default value of “1” to “0.5” of the plot scale. (Example: plot scale is 1”=100’; therefore, LTSCALE = 50.)

The Model Space plot factor should be indicated on the drawing as 1 plotted inch = X drawing units considering the appropriate size paper. If paper space is used the plot will be 1 plotted inch = 1 drawing unit.

The Text Style is **ROMANS** in the vertical position consistent throughout the entire project. The minimum plotted text height will be .06 inches (or units). The range for small text height is 0.06 to 0.12 inches ; medium text is 1.5 times the small text height used; and large text will equal 2 times small text height. When using a 22x34-inch sheet size, the minimum text height will be 0.125 inches for small text, 0.18 inches for medium text, and 0.24 inches for large text. This allows the text size to meet national standards should the drawing be reduced 50%.

The Hatch Pattern Scale when plotting should normally approximate 1/2 of the plotted scale. For example: plot scale is 1”=100’; therefore, hatch pattern scale is 50.

Color and linetypes shall be set to **BYLAYER** and are described in Table 1.

TABLE 1

PEN ASSIGNMENTS for PLOT/PRINT

SIZE	COLOR	PEN NUMBER*	LINE WIDTH (mm)
Thin	1 (red)	7	0.127
Thin	5 (blue)	7	0.18
Thin	3 (green)	7	0.25
Thin	4 (cyan)	7	0.30
Medium	2 (yellow)	7	0.35
Medium	6 (magenta)	7	0.50
Medium	7 (white)	**7**	0.60
Thick	8	**7**	0.70
Thick	9	**7**	0.80
Thick	10	**7**	1.2
Thin	253 (gray)	**7**	0.18
Medium	252 (gray)	**7**	0.50

*Set **Pen No**. to 7 to print black lines when using a color plotter or printer.

Note: A file called shading.ctb has been created with these features incorporated and can be loaded into:

C:\ Document and Settings\(your file name)\Application Data\AutoDesk\AutoCad LT\(revision no.)\enu\Plot Styles.

When this is done go to Tools, options from the pull down menu then select the Plotting Tab. Then move down the right side of Plotting Tab to Default Plot Style Table and select shading.ctb as your default plot style and hit the APPLY button and exit.

Layer names should be descriptive of the objects on that layer. The layers listed in Table 2 can be combined and/or expanded as needed. For example, an existing fence might be on a layer called EXIST-FENCE, or a woody debris structure might be on a layer called STRUC-WOODY. Use the main item first and expand from there. This allows better layer management since AutoCAD or ACAD LT alphabetizes the layers. An example with expanded hatch layers might be as follows:

HATCH-GABION
HATCH-RIPRAP
HATCH-FILL
HATCH-EXC

New or proposed objects will have a color of 2. Most existing objects will have a color of 253. In this case, you may want to expand layers with EXIST before the main item as follows:

EXIST-DIKE
EXIST-FENCE
EXIST-RIPRAP

TABLE 2

RECOMMENDED LAYERS/COLORS

LAYER NAME	DESCRIPTION	COLOR	LINETYPE
ARW-N	North arrow	3	
ARW-S	Section arrow	6	
BLDG	Building	2	
BORDER	Title block border	9	
BOULDER	Boulders or large rock		
CL	Centerline	5	center
CNTY	County lines	2	
CON_PERMIT	Construction Permit	7	dashedx2/dashed
CONT	Contour lines	253 and 252	continuous
DEFPOINTS	***layer does <u>not plot</u> even when turned on***		
DIM	Dimension	3	
DITCH	Ditch	3	trpldot
ESMT	Easement	7	phantom
FENCE	Fence line	3	
GEOLOGY	Geology information	3	
GRID	Grid lines	253	continuous
GROUND	Natural ground	3	dashed
HATCH	Hatch patterns	1,5 or 253	
HIDDEN	Hidden object lines	2	hidden
MTCH	Match lines	7	
PIPE	Pipeline	6	symbol
PL	Property line	4	phantom
PNTS	Points	1	
REBAR or Steel	Rebar reinforcement	7	continuous
RIPRAP	Riprap	1,5 or 253	
RIVER	River boundary	3	
RLRD	Railroad	2	
ROAD	Roads	2	
RW	Right-of-way	7	dashed2
SCALE	Bar scale	2	
SLOPE	Slope arrows	3	
STATE	State boundary	5	
STRUC	Structures	2	
TBK	Top of bank		
TBM	Temporary benchmark	3	
TOE	Toe of slope		
TXT-L	Large text (2X small text ht)	7	
TXT-M	Medium text (1.5X small text ht)	5	
TXT-S	Small text (including dimensions)	3	
UTIL	Utilities	2 or 3	
VEGE	Vegetation	2 or 3	
XIST	Existing	2	

Bar scales on drawings must be carefully selected to insure clarity of details. The manner of reproducing copies must be fully considered in setting the scales to be used. The minimum scale of structural layout sheets will be 1/4 inch equals 1 foot. Except for simple reinforcing systems, the minimum scale for structural details will be 3/8 inch equals 1 foot. If possible, drawings that may be copied at a reduced size should have graphic scales and be drawn to a minimum scale of 1/2 inch equals 1 foot. When drawings lacking graphic scales must be copied at reduced size, each reduced sheet must bear a prominent warning note that the drawing is of reduced size and the indicated scales are not accurate. Special care must be taken to insure that such notes are not also copied on contact prints.

Notes on the drawings are to be limited to those required for complete and accurate interpretation of the drawings and those required to supplement the contract specifications. Except for standard notes (such as General Notes, Structural Notes, and Design Data) that generally apply to all drawings within a set, each note is to be placed on the drawing sheet to which it directly applies. All notes are to be lettered or typed in lower case with normal capitalization.

Cover Sheet

Each set of construction drawings consisting of more than five sheets is to have a cover sheet giving the name and location of the project, the names of the sponsoring agencies or owners, an index of drawings, spaces for approval signatures and, if appropriate, the seal of the engineer. If space permits, it may also include the location map and such general notes and design notes as may apply to the drawings.

Land Rights Work Maps

NRCS is responsible for providing land rights work maps that show the minimum construction requirements. Sponsoring local organizations are entitled to confidence that land rights requirements will not change after an approved land rights work map has been provided to them.

The following procedure is followed in developing land rights work maps:

(1) NRCS shall prepare land rights work maps. The maps will serve as working tools in acquiring and checking the acquisition of land rights. The maps are a visual picture of the rights needed and those existing works that may be affected. They are not construction drawings. The map shows data essential to acquire land rights and to review the documents to assure that all needed rights and permits are covered. The minimum data to be included are: landmarks for location, flowage elevations, apparent ownerships and tract acreages, apparent property boundaries, location of the project measure, installations affected by construction and flowage such as roads, utility lines, pipelines, railroads, buildings, wells, springs, bridges, fences, and any structure of any kind that is located in the easement area shall be shown on the land rights work map. Other data should be included as necessary for the project such as borrow and spoil areas.

(2) If NRCS determines that routes of ingress and egress are dictated by certain factors, such as environmental factors, the routes shall be included in the land rights work map. Otherwise, the map shall contain a statement that the sponsors will determine routes of ingress and egress and acquire the necessary rights for such routes. A land rights work map index shall be included on the land rights work map to be used as a checklist. The index is to show the ownership and rights needed as a minimum. The land rights boundaries may be set forth by subdivision of sections or by distances and angles from a reference point. Where subdivision of sections is used to block out the area, flowage and borrow areas should be shown by elevation and sketch. This will permit the sponsors to have a metes and bounds survey made if necessary, to reduce the land area included in land acquisition documents to a minimum.

The land rights map and all amendments must show the State Conservationist's approval. It is essential that the easement boundary on each sheet have a survey tie to a section corner, survey monument, or other permanent landmark.

(3) The data required to prepare the land rights work maps shall be developed from: topographic maps, planning surveys, land rights field survey data, recorded plats, or other survey information available in the county clerk's office or local abstractor's files provided by the sponsors.

Maps for Construction Drawings

The state location map showing the counties shall be on the cover sheet or on sheet 2 of the drawings. Additional maps shall depict a location map and a project vicinity map. A north arrow shall be shown on all sheets that include maps and shall be oriented to point toward the top of the sheet. If that orientation is not feasible, the map should be drawn with North to the left-hand side of the sheet.

There are two types of state maps in the Drafting Guidance CD. The first one is a complete state map with all the counties. The project county is bolded by picking the project county and going to Tools \ Display Order \ Bring to front and changing the color to a wider pen. Parts of surrounding counties will overlap.

The second is the state outline and individual counties. First bring up a title block and then install the outline of the state within the border. Then insert the county you want into the title block and then highlight the outline of the state to get your grip and handle points to light up. Highlight your county the same way and now do a MOVE of the county to the handle point of the state.

Counties, ranges, townships, roads and local features that identify the project should be shown to the extent possible. If no city appears on the map, a highway direction arrow giving the distance to the closest city should be shown. A bar scale should be placed on all maps and it should be scaled to represent miles.

The job site should be identified on the maps so it stands out clearly above everything else. Use bold letters and a heavy arrow to point to the site.

On all construction drawings for major engineering works, Class (b) and Class (c) dams, and Class (a) dams that impound more than 15 acre-feet of water, all structure reference lines and right-of-way limits are to be referenced to fixed and readily identifiable geographical points. Smaller jobs are to include at least a simple location map containing readily identifiable landmarks.

Plan of Improvements

General Plan

The following list of items is offered as a guide only for use in preparing non-structural plan views:

1. Centerline alignment and stationing of proposed construction.
2. Standard north arrow.
3. Property lines and owners.
4. Existing and proposed fences.
5. Work limits boundaries.
6. Curve data.
7. Proposed structures.
8. Match lines.

9. Bench marks (location, description, and elevation).
10. Preliminary Survey Line (P.S.L.) or base line.
11. Utility lines - buried or overhead.
12. Existing pipelines.
13. Existing roads, culverts and bridges
14. Contour lines of existing topography.
15. Grading lines of proposed works.
16. Existing structures (for removal or to remain in place).
17. Bearings (if required).
18. Survey coordinates.
19. Brush and trees (for removal or to remain in place).
20. Plot flow from left to right or bottom to top of sheet.
21. Title centered under view with scale centered under title.
22. Show legend of all items shown on plan layout.
23. Bar scale.

Plan of Dam and Reservoir

This sheet consists of an overall layout of the dam and reservoir. Orientation should be with the direction of flow from left to right or from the bottom to the top of the sheet. The direction of flow and the north directions will be indicated with arrows. Items usually shown are:

1. Existing contours (index and intermediate).
2. Graded (new) contours (index and intermediate).
3. Stationing on centerline of dam.
4. Intersecting station of centerline of dam and auxiliary spillway.
5. Intersecting station of centerline of dam and principal spillway.
6. Bearings, centerline of dam, coordinates, et cetera.
7. Fences, power lines and poles, utilities, et cetera, that lie within the construction boundaries (limits).
8. Location of borrow areas and test holes and pits (if separate sheet is not developed).
9. Bench marks and ties from centerline of dam to section corners.
10. Clearing, grubbing, stripping boundaries and blanket boundaries.
11. Right-of-way limits.
12. Curve Data (All curve data should be given in vertical lettering.)
13. Graphic Scale.

When necessary to clarify details, it may be advisable to develop a sheet showing the plan of dam at a larger scale.

Where several references to details need to be given on a sheet, consider placing them in a table. This will not clutter up the drawing and detract from showing important information. A sample for the large plan map for a dam might be:

Profiles and Cross Sections

Cross Sections in General

1. Cross sections should be plotted on true scale (same scale horizontally and vertically) if possible.
2. Show elevations on both sides of the cross section if the cross section is drawn to scale.
3. Show distances from centerline or reference line below the cross section.
4. Label the existing ground as "Approximate existing groundline."

5. Use a solid line for construction lines.
6. Show adequate number of cross sections to indicate various types of situations encountered.
7. When showing a series of cross sections, plot from bottom to top of sheet in order of stationing.
8. Dimension the width of the cross sections.
9. Label the proposed constructed side slopes parallel to the slope.
10. Label the constructed elevations on the sections unless shown as a typical cross section and covering a range of stations.
11. Show soil borings if applicable.
12. Plot channel or ditch cross sections looking downstream.
13. When plotting a series of cross sections, use the same centerline for all of the sections.
14. When placing several cross sections on a sheet, start with the lowest numbered station at the bottom of the sheet and proceed in numerical order to the top of the sheet. If two or more rows of cross sections are shown on the same sheet, start at the lower left, proceed to the top, then return to the bottom and repeat the order
15. Plot dam cross sections so that the upstream side of the section is on the left side (flow from left to right).

The following applicable specification information is to be shown:

1. Excavation pay limits.
2. Earthfill pay limits.
3. Drainfill pay limits.
4. Rip rap pay limits.
5. Clearing and grubbing limits.
6. Spoils stockpile limits
7. Waste area limits.

Profile and Cross Section of Dam

This sheet normally contains a profile on the centerline of the dam and a maximum cross section. The profile shall be placed on the top half of the sheet shown facing downstream and includes the following:

1. Stations and elevations.
2. Top of dam and camber (elevation of both).
3. Maximum water surface elevation.
4. Principal and auxiliary spillway crest elevations.
5. Line denoting approximate depth of cutoff trench.
6. Outlet conduit (station and invert elevation).
7. Approximate existing groundline.
8. Soil profiles of test pits and borings.

The maximum cross section shall be placed on the bottom half of the sheet. It shall be normal to the centerline with the upstream face to the left side of the sheet. The following data should be placed on the maximum cross section:

1. Upstream and downstream slopes and berms.
2. Zones of the fill.
3. Top of dam and camber (elevation and width of both).
4. Maximum water surface elevation.
5. Principal and emergency spillway crest elevations.
6. Natural ground line and stripping line.
7. Cutoff trench and/or slurry trench.

8. Filter drain and/or toe drain.
9. Riprap and filter bedding.

Principal Spillway Profile and Cross Sections

A cross section through the conduit should be drawn with flow from left to right, contain the above information, pay limits and other data appurtenant to the inlet structure, reinforced concrete conduit, and outlet structure.

Auxiliary Spillway Profile and Cross Sections

The direction of flow for the auxiliary spillway profile should be drawn from left to right and following data shown:

1. Stations and elevations.
2. Crest elevation and station.
3. Approximate existing groundline, stripping line, and left and right banks.
4. Slope of approach and exit channels.
5. Side slopes.
6. Structural element (if any).
7. Soil profiles of test pits and borings.

Cross sections should be drawn perpendicular to the centerline, looking in the direction of increasing stations, and the following shown:

1. Approximate existing groundline.
2. Bottom width.
3. Side slopes.
4. Excavation pay limits.
5. Earthfill pay limits.

Channel Profile and Cross Sections

Channel profiles are to be developed with even stations on heavy lines and contain the following information:

1. Approximate existing groundline.
2. Channel bottom, slope. invert elevation at each end of reach shown.
3. Grade changes (station and invert elevation).
4. Approximate locations of utilities (station and elevation).
5. Channel dike (slope and top elevation).
6. Side drain locations (station and invert elevation) and riprap or other protection.

When space permits, one or more cross sections should be included. Cross sections should be drawn looking in the direction of increasing stations. When possible, they should be drawn at a natural scale and show the following:

1. Bottom width.
2. Side slopes.
3. Concrete or riprap and filter protection if applicable.
4. Channel and/or side drainage.
5. Dike, berm or roadway widths and side slopes.
6. Construction or right-of-way limits.
7. Excavation and earthfill pay limits.

8. Backfill compaction requirements, if applicable.
9. Clearing and/or grubbing limits.
10. Spoils or waste limits.

Structural Details

The detailing of structural drawings shall conform to Section 6 National Engineering Handbook. The following is from Part 4.4.1 and 4.4.4 of Section 6, NEH.

> "Structural drawings should be simple, clear, complete and accurate. They should not contain unnecessary lines, dimensions, symbols, or notes. They should contain, however, all the essential information supplemented by an adequate set of notes... Such drawings save time and expense in the drafting room and on the job."

The first step in making structural drawings and detail drawings is to become very familiar with the object to be shown. In most structures, a **minimum** of three views is required. These are top (plan), front (elevation) and side. The plan view is the "master" view from which most of the other views can be cut or projected. Any view cut through the structure is called a section. Any view showing the outside of the structure is called an elevation. It is good practice to be consistent in showing these various views. The plan view should be placed near the upper left corner of the sheet. Leave enough room around this and all views to allow for section arrows, dimensions, lines, notes and title. Place the elevation view directly below and in line with the plan view. The side view is placed to the right of the elevation view and is kept in line with it. The selection of a scale is important. Bar scales will be placed on all drawings. Architect Scales should be used on structural and steel detail drawings. The minimum scale of structural layout sheets will be 1/4" = 1'-0". Except for simple reinforcing systems, the minimum scale for structural will be 3/8" = 1'-0". If possible, drawings that may be copied at a reduced size should have a bar scale and be drawn to a minimum scale of 1/2" =1'-0". Please observe the AutoCAD Guidelines on how to set up your drawing in model space and how to plot in paper space.

An isometric drawing is the most frequently used method for making three-dimensional drawings. An isometric drawing is a three-dimensional drawing made with the receding axes drawn at 30° from the horizontal. The angle between each axis is equal to 120° and may be revolved as shown in Fig 1. True measurements are made along the three axes or parallel to the axes. Isometric drawing is one type of axonometric drawing. Dimetric and trimetric drawings are also axonometric drawings but they will not be discussed here.

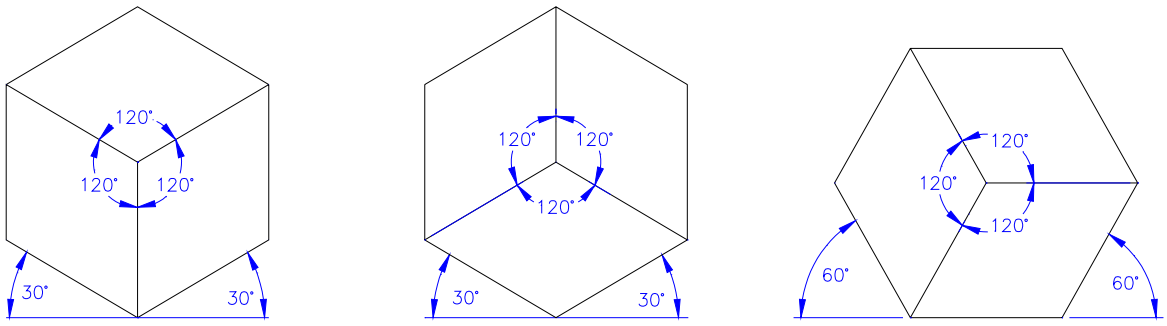


Fig. 1

Isometric lines are lines that are along the axes or parallel to the axes of the isometric drawing. True measurements can be made only along isometric lines or parallel to these lines. Non-isometric lines

are inclined lines that cannot be measured. They are lines that are neither along the axes nor parallel to the axes of the isometric drawing.

Steel Reinforcing Details

When detailing a reinforced concrete structure, the first sheet shall be the structural layout sheet. This sheet will show the overall features and dimensions. The steel placement and general dimensions to facilitate construction, as well as special details, are shown on the succeeding sheets. Each structure should show pertinent elevations and stations to facilitate field layout. If several identical structures are to be installed, this information can be given in tabular form.

The structural layout and structural details may be combined when the structure is of a simple nature and dimensions and details of the structure, along with the appurtenances, can be shown on the same drawings without crowding and making the drawing difficult to interpret.

The method of showing and designating the reinforcement depends largely upon the complexity of the structures and whether or not a steel schedule is needed. When detailing steel in plan or elevation views, it is a generally accepted practice to show, only the first and last bars of a series. When a steel schedule is required, show all bars of different lengths and sizes. In sectional views, show all bars. The following nomenclature should be used for describing the location of the bars:

Plan (floor slab, footing) - top face, bottom face.
Elevations (sidewall) - exposed face, unexposed face (side adjacent to earth).
Elevations (riser sidewalls) - inside face, outside face.
Elevations (headwall, cutoff wall, transverse sill) – upstream face, downstream face .

There are two procedures for designating the bars. When no steel schedule is required, steel may identified with bar size and spacing, such as #5 @ 12 each face, each way. Note that the inch designations are omitted.

When a steel schedule is made, the bars should be identified with a unique label. The steel schedule may be shown on a separate sheet following the structural layout and details, or it may be placed on the last sheet(s) of the structural details, or it may be a separate document.

The following is a list of steel reinforcing conventions:

1. Unless otherwise specified the clear cover over reinforcing steel shall be 2", except where concrete is placed against earth it shall be 3". A note shall be placed on the drawings indicating these are clear distances.
2. Where principal steel is required in only one direction, it shall be placed nearer the concrete surface than the temperature steel.
3. Where principal steel is required in both directions, the steel that carries the larger moment shall be placed nearer the concrete surface.
4. Where principal steel is required in neither direction, the temperature steel parallel to the longer dimension of the slab or wall shall be placed nearer the concrete surface.
5. Bent bar dimensions are out-to-out.
6. The distance center to center of parallel bars shall be measured perpendicular to the longitudinal axis of the bars.
7. Steel bars shall be identified with a three-digit number, such as "504". The first digit indicates the size of the bar - #5 bar in above example. The last two digits indicate the numerical sequence of the bar in the structure.
8. Different parts of a structure shall be named on the drawings, such as; headwall, inlet floor, downstream (DS) wingwall, et cetera. The same names shall be used, under location, on the steel schedule. Also, on the steel schedule, the designations (E), (U), (I), (0) shall be used to indicate

exposed, unexposed, inside, or outside steel as the case may be.

9. Bars will be grouped on the steel schedule, according to their location in the structure, as much as possible. The bars from the first sheets of reinforced steel drawings will generally be the bars shown on the first sheets of the schedule, et cetera.
10. Identical bars shown in different locations will generally have different identifying numbers.
11. NEH-19 shall be used for the designation of type of bar bends. Other bar bends shall be designated as special (SP-1) and shown on the drawings.

Miscellaneous Details

Geotechnical Information

It is the responsibility of the geologist and the design engineer to furnish the drafting technician with adequate soils and geologic information.

The following soils data are required:

1. Location (stations and elevations).
2. Test hole or test pit numbers.
3. Soil identification (SM-silty clayey sand).
4. Geologic information.
5. Water table and data recorded.

Checking Drawings and Revisions

All work is to be checked and reviewed prior to the approval of the drawings.

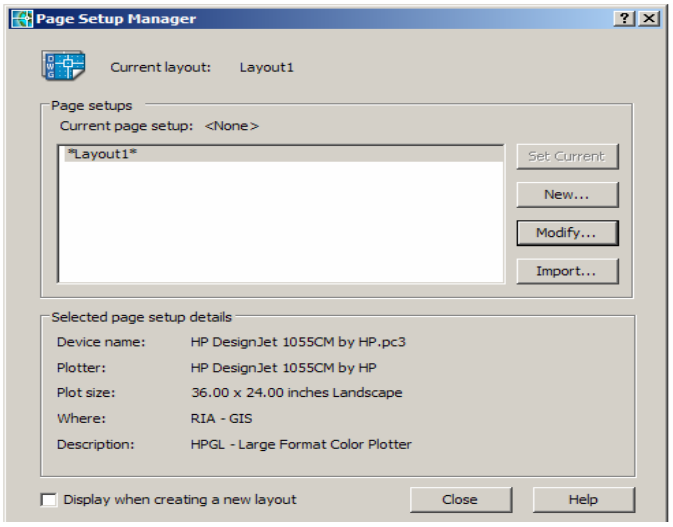
When checking a hard copy of the drawings, use a red pencil to indicate corrections. If corrections cannot be neatly shown, draw a sketch and attach it to the checked print. All data that is corrected should be checked with a blue pencil.

When major revisions are required for a set of construction drawings that have been approved, the changes are identified and recorded in a revision block. The revision block will be placed to the left of the title block. It will contain the date of revision, initials of the person submitting the revisions and brief description of features revised. If the revision necessitates the re-drafting of a sheet, the voided sheet must be marked "VOID" and dated.

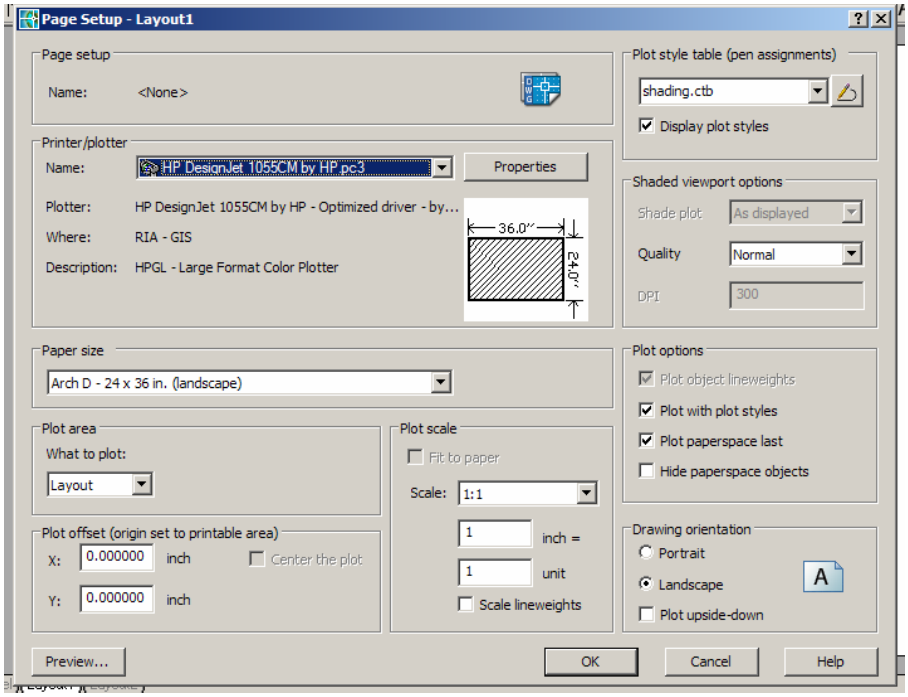
AUTOCAD 2005 GUIDELINES

This part of the guidance document is structured for the draftsperson that is already familiar with AutoCAD software and does most of their work in CAD. It is not an instruction manual on how to use AutoCAD. As an Agency we are trying to promote consistency and quality in drawings that are created in Field Offices and the State Office. All drawings produced in New Mexico should follow these guidelines.

When starting a new drawing in AutoCAD it is easiest to start with a template or an existing drawing with all the styles and settings in place, then just Save As a .dwg file. Before drawing anything, make sure your units are set to Decimal, Architectural or whatever you will be working in. AutoCAD drawings are created in model space at an **exact** scale. The drawings should be plotted from paper space. Before plotting, a paper space layout needs to be setup in the AutoCAD drawing. While in AutoCAD click on one of the available layout tabs next to the model space tab and you should see a blank page then right click the same tab and go to **page setup** (See dialog box below):



Click on New or Modify



Check Display plot styles

Pick a Printer/Plotter that is available to you and by clicking on Properties you can select the correct size of paper you will be using. Then you must pick a **Plot style table** (pen assignments.) Shading.ctb is New Mexico's standard default pen file to use. This plot style table was adapted from the West Regional Standards. There is also an 11x17shading.ctb file which is used for 11" x 17" sheets. ***The line width on drawings is determined by these pen files.*** If drawings are sent to the State Office or another Field Office they will plot correctly if we all use the same pen file. See the New Mexico CAD Std_2004.doc for more information on what color corresponds with what line thicknesses.

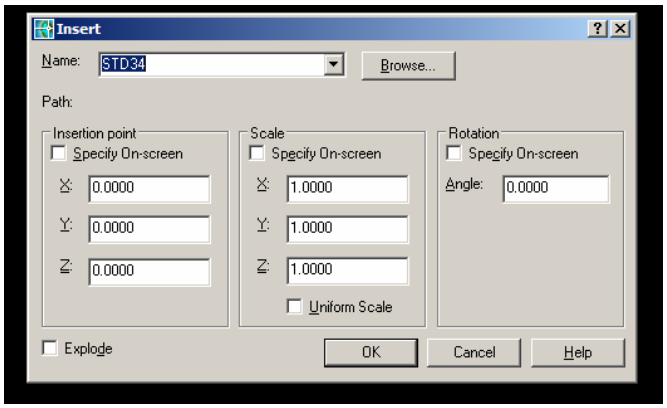
Continue the setup by clicking the box **display plot styles** to the right of the plot style table.

The **Plot scale** will always be 1:1 because you should be plotting from paper space not model space.

Paper size is self explanatory, as is **Drawing Orientation**. Then click **OK** when finished setting up your page.

You are then returned to the paper space layout, where you see what appears to be an actual sheet of paper. Now let's put in New Mexico's standard title block by typing the **DDINSERT** on the command line. The **Insert dialog box** appears. Browse to find Std34.dwg (There is a copy on S:\ENG\Drafting Standards\Std34.dwg and on the guidance CD) click on OK and insert it on your "paper".

Leave Insertion point at 0,0,0 for the title block.



The title block is 22" x 34" and is centered on our 24" x 36" sheet of paper.

Now you can place viewports on the "paper" inside the title block border by using the **–VPORTS** command or by accessing the viewports toolbar. One viewport or several can be created inside the title block border. Avoid putting a viewport inside an existing viewport. To set the scale of your viewports you can use the viewport toolbar or the **ZOOM** command.

The following chart will help determine what XP factor you need so that the correct scale is set in each viewport.

Zoom XP Factors	
Desired scale on paper	**XP factor**
1 inch = 100 feet (1 unit = 1 foot)	1/100XP or 0.01XP
1 inch = 60 feet (1 unit = 1 foot)	1/60XP or 0.0167XP
1 inch = 50 feet (1 unit = 1 foot)	1/50XP or 0 .02XP
1 inch = 40 feet (1 unit = 1 foot)	1/40XP or 0 .025XP
1 inch = 30 feet (1 unit = 1 foot)	1/30XP or 0.0333XP
1 inch = 20 feet (1 unit = 1 foot)	1/20XP or 0.05XP
1 inch = 10 feet (1 unit = 1 foot)	1/10XP or 0.1XP
1/16 inch = 1 foot – 0 inches	1/192XP or 0.0052XP
1/8 inch = 1 foot – 0 inches	1/96XP or 0.01042XP
3/16 inch = 1 foot – 0 inches	1/64XP or 0.015625XP
1/4 inch = 1 foot – 0 inches	1/48XP or 0.02083XP
3/8 inch = 1 foot – 0 inches	1/32/XP or 0.03125XP
1/2 inch = 1 foot – 0 inches	1/24XP or 0.04167XP
3/4 inch = 1 foot – 0 inches	1/16XP or 0.0625XP
1 inch = 1 foot – 0 inches	1/12XP or 0.0833XP
1 1/2 inch = 1 foot – 0 inches	1/8XP or 0.125XP
3 inches = 1 foot – 0 inches	1/4 XP or 0.25XP

After the scale is set and you can see your drawing is inside the viewport, lock each viewport by using the **VPORTS** command (type at command line), LOCK, ON. This will allow you to modify the drawing from paperspace, just click inside the viewport and it puts you in model space. From here you can pan or zoom in and out without losing the scale assigned to the viewport.

AUTOCAD TEXT STYLES

When starting a new drawing make sure your current text style is set to Romans. Type **STYLE** at the command line. This opens the text style dialog box. Scroll down under the font drop down menu and find the Romans.shx font. Highlight this and then choose new and type in Romans. **Leave height at 0.000** and close. Set the text height as you create text. The text height for text plotted from model space should be multiplied by the scale factor. (See Scale Ratios Tables below) Text created directly on a layout (paperspace) should be set to true size (1:1).

ARCHITECTURAL SCALE RATIOS			
Scale	**Scale factor**	**To plot text size at**	**Set drawing text size to**
1/8” = 1’-0”	96	1/8”	12”
3/16” = 1’-0”	64	1/8”	8”
1/4” = 1’-0”	48	1/8”	6”
3/8” = 1’-0”	32	1/8”	4”
1/2” = 1’-0”	24	1/8”	3”
3/4” = 1’-0”	16	1/8”	2”

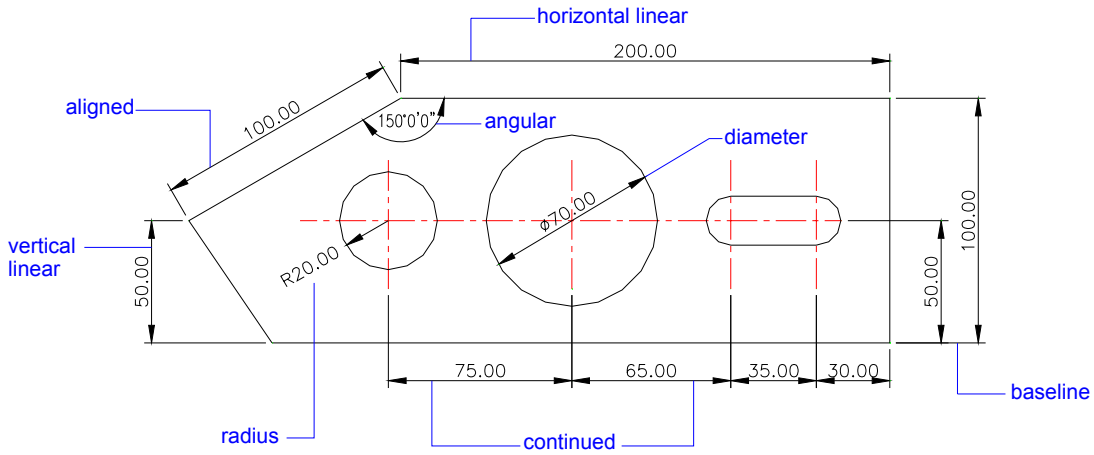
1” = 1’-0”	12	1/8”	1.5”
1 1/2” = 1’-0”	8	1/8”	1.0”
3” = 1’-0”	4	1/8”	.5”

ENGINEERING SCALE RATIOS			
Scale	**Scale factor**	**To plot text size at**	**Set drawing text size to**
1”= 10’	10	1/8”	1.25
1”= 20	20	1/8”	2.50
1”= 30	30	1/8”	3.75
1”= 40	40	1/8”	5.0
1”= 50	50	1/8”	6.25
1”= 60	60	1/8”	7.5

When using a 24 x 36-inch sheet size, the minimum text height will be 0.125”, 0.18” for medium text and 0.25” for large text. This allows text size to meet national standards should the drawing be reduced by 50%. Other fonts are used on the Standard title block and when used with the shading.ctb pen file they will plot correctly. Consistency should be the golden rule when drafting multiple sheets.

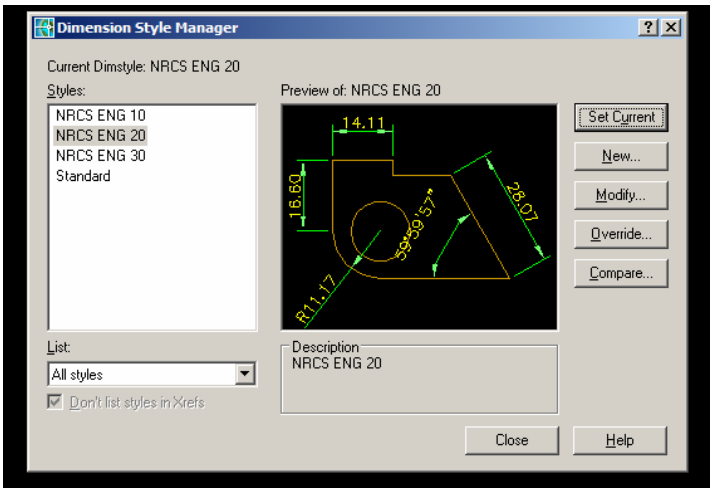
DIMENSIONING IN AUTOCAD

Dimensions show the measurement of objects, the distances or angles between objects, or the distance of a feature from an origin you specify. AutoCAD provides three basic types of dimensioning: linear, radial, and angular. Dimensions can be horizontal, vertical, aligned, rotated, ordinate, baseline, or continued. Some simple examples are shown in the illustration.



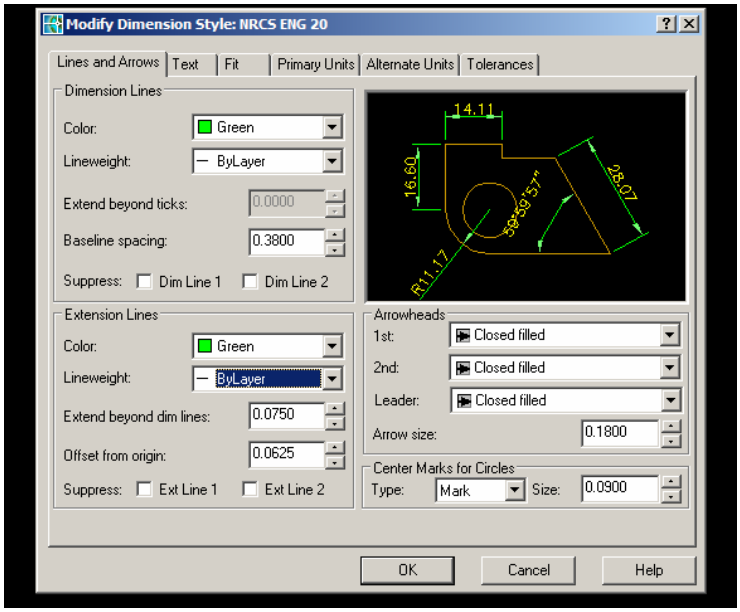
You can dimension objects, such as lines, arcs, circles, and polyline segments, or you can dimension between point locations.
AutoCAD places dimensions on the current layer. Every dimension assumes the current dimension style, which controls characteristics such as arrowhead style, text location, and lateral tolerances.

Set up a dimension style for each of the scales you will be plotting in. For example I know I want to plot my drawing at a 1" = 20' scale. Your dimension style could be called NRCS ENG 20. Type **DDIM** or **DIMSTYLE** at the command line. This brings up the Dimension Style Manager dialog box. Click on **new** button then type in your new style name ie: NRCS ENG 20. Then click continue.



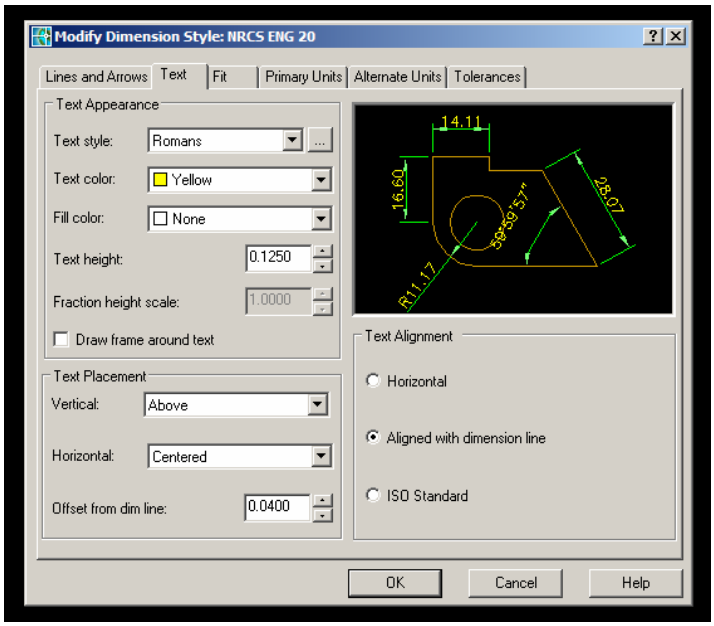
Under the **Lines and Arrows** tab set the Color to green and the Lineweight ByLayer. Change the Extend beyond dim lines to 0.0750 and leave the other settings to the default.

Color can also be set to ByLayer, just make sure you're Dimension Layer color is set to green. Also make sure all your dimensions go on only this layer.



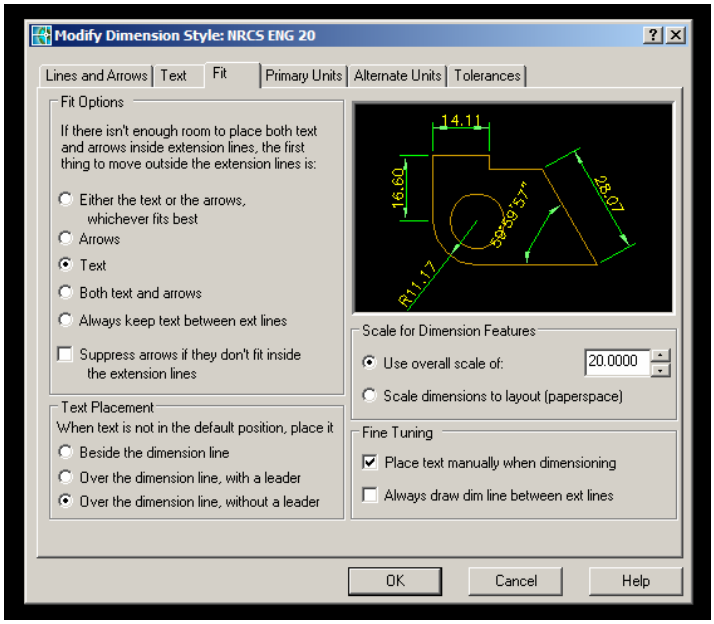
Next go to the **Text** tab. Make sure Romans is the text style and also change the color of text to yellow. Then change the text height to 0.125.

Fill color creates a text mask to hide lines under the dimension text.



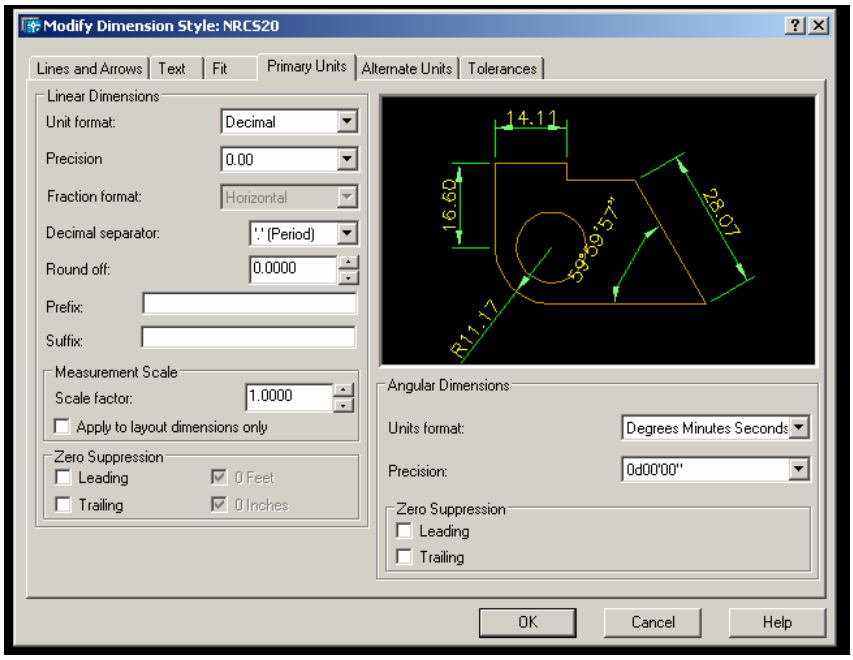
Make other text changes as shown on the above dialog box.

Next select the **Fit** tab and follow these setting.



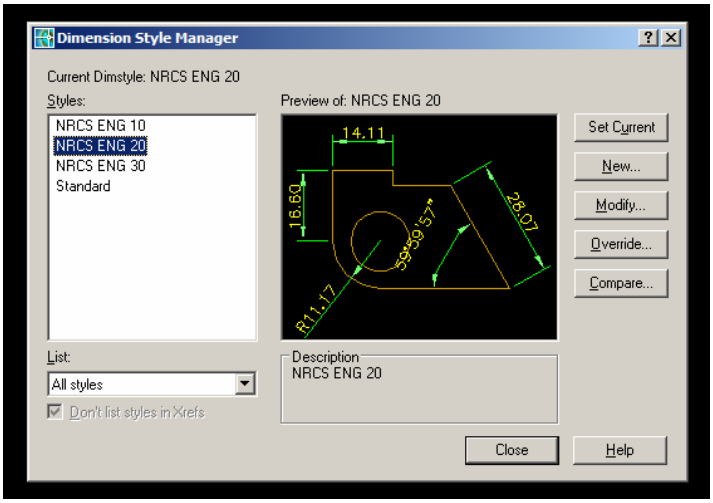
Important: set to correct scale.

Next select the **Primary Units** tab. In this case we will set up our units to decimal because we will be plotting to an engineering scale of 1” = 20’.



It’s a good idea to change the precision and units here too.

Most of our drawings in NRCS don’t require us to enter alternate units or tolerances, so check the OK box.



Make sure the Correct style is highlighted in the Styles box and click on the Set Current box and then Close.
If several dimension scales will be needed just create new styles from the NRCS ENG 20 style we just created. Make sure to change the overall scale and that’s all there is to it.

AutoCAD Tips & Tools

This is a sampling of the hundreds of tips that may exist. These are typed at the command line unless otherwise stated.

PURGE
Removes unused named items, such as block definitions and layers, from the drawing.

WMFBKGND
Controls whether the background display of AutoCAD objects is transparent in other applications when these objects are:

- Output to a Windows metafile using the WMFOUT command
- Copied to the Clipboard in AutoCAD and pasted as a Windows metafile
- Dragged and dropped from AutoCAD as a Windows metafile

The AutoCAD defined values are:

Off - The background color is transparent. The foreground color will depend on the setting of WMFFOREGND.

On - The background color is the same as the AutoCAD current background color, whether in model space or in a layout. The foreground color remains unchanged.

WMFFOREGND
Controls the assignment of the foreground color of AutoCAD objects in other applications when these objects are:

- Output to a Windows metafile using the WMFOUT command
- Copied to the Clipboard in AutoCAD and pasted as a Windows metafile
- Dragged and dropped from AutoCAD as a Windows metafile

WMFFOREGND applies only when WMFBKGND is set to Off.

The AutoCAD defined values are:

Off - The foreground and background colors are swapped if necessary to ensure that the foreground color is darker than the background color

On - The foreground and background colors are swapped if necessary to ensure that the foreground color is lighter than the background color

TIP: MTEXT Zooming
On entering the MTEXT dialogue box you find the text is displayed either too small or too large. Holding down the CTRL Key and rolling the wheel on your mouse can easily resolve this problem. Depending on which direction the wheel is rolled will determine whether the text appears larger or smaller.

AUDIT
A diagnostic tool for examining the current drawing and correcting errors. For every error detected, AutoCAD provides a description of the error and recommends corrective action.

RECOVER
Repairs a damaged drawing

CECOLOR

Sets the color of new objects. Valid values include BYLAYER, BYBLOCK, and an integer from 1 to 255 (It's always a good idea to keep objects colored by layer. This way if you need to change the color later, then all you have to do is change the color in the layer properties manager dialog box)

PLOTSTAMP

Specifies the drawing information you want applied to the plot stamp. The selected fields are separated by commas and a space.

PEDIT

The next time you convert LINES to POLYLINES using the PEDIT command and you do not want to be asked whether or not you want to do it, set the system variable PEDITACCEPT to 1 and this prompt will no longer appear.

LTSCALE

Sets the global linetype scale factor. The linetype scale factor cannot equal zero. Use LTSCALE to change the scale factor of linetypes for all objects in a drawing. Changing the linetype scale factor causes the drawing to regenerate.

Tip: What LT or Hatch Pattern Scale do I use?

Trying to establish an ideal Linetype or Hatch Pattern Scale can sometimes be a frustrating trial and error experience. The following formulas may help to reduce the frustration and time it takes to establish a preferred scale.

LTSCALE = (longest length of line using linetype)/420

HPSCALE = (longest length of area to be hatched)/150

Note: AR patterns are considered "Full Size" patterns. Therefore, if the area to be hatched is drawn at an appropriate size, a scale of 1 should suffice.

OOPS! A Forgotten or Unknown Command?

OOPS may be an unfamiliar command, especially for new users. This was a command that was originally introduced to bring back erased entities recently used to create *Blocks. (*The Make Block Dialogue box has a "Retain" option that performs this task now.) OOPS, unlike UNDO, will only bring back the last erased objects and will not undo any additional work carried out since the erasure. To use this command, simply type it in via the keyboard.

Tip: Automatic Panning

When about to use a selection window and you suddenly realize you cannot see enough of the drawing, just hold the pick button down for the first corner of the window and drag the cursor to the edge of the screen. AutoCAD will automatically start to pan. When enough of the drawing is visible, release the pick button and select the desired "opposite corner"

DDEDIT

Have you ever found yourself confused as to whether you are editing Text or Attributes in AutoCAD at times? Often I have seen users start up DDEDIT thinking they are about to edit a piece of Text and not be able to edit it. Why, because it is an attribute in a block. This behavior has been changed in AutoCAD 2005. You can use DDEDIT to edit Attributes that are in or out of a block, Text, Mtext, Leaders or Dimensions. This allows you to focus on making changes to your design by taking the guess work out of which command you need to use to edit the annotation.

COPY

You can now copy an item multiple times with out having to type “M” first.

HATCHEDIT

This is a great command that lets you modify your Hatching. One option is to change the draw order of a hatch or fill. You can place a hatch or fill behind all other objects, in front of all other objects, behind the hatch boundary, or in front of the hatch boundary.

TEXTTOFRONT

Bring to front: [Text/Dimensions/Both]<Both>: Enter an option or press ENTER

Text: Brings all text in front of all other objects in the drawing.
Dimensions: Brings all dimensions in front of all other objects in the drawing.
Both: Brings all text and dimensions in front of all other objects in the drawing

eTransmit

With eTransmit, you can package a set of files for Internet transmission. Drawing files in the transmittal package automatically include all related dependent files such as xrefs and font files. You can also create a transmittal package from a sheet set.

A common problem when sending drawing files to someone is neglecting to include related dependent files such as xrefs and text fonts. In some cases, not including these files can make the drawing files unusable by the recipient. With eTransmit, dependent files are included automatically in the transmittal package, reducing the possibility of error.

CONVERTPSTYLE

A drawing can use either named or color-dependent plot styles, but not both.

CONVERTPSTYLES converts a currently open drawing from color-dependent plot styles to named plot styles, or from named plot styles to color-dependent plot styles, depending on which plot style method the drawing is currently using.

For example, a drawing using color-dependent plot styles assigns plot properties to objects and layers by color. In other words, all objects with the same color have the same plot properties. CONVERTPSTYLES converts the drawing to use named plot styles that can be applied to objects or layers independent of color assignment. In other words, all objects with the same color can have different plot properties.

CONVERTCTB

Converts a color-dependent plot style table (CTB) to a named plot style table (STB)

Choose your Drawing Units wisely:

1 foot drawn in Decimal units becomes 1” (.08333’) if units are changed to Architectural.

1 foot drawn in Architectural units becomes 12’ if drawing units are changed to decimal.

All Structural (concrete, steel and metalwork detail) drawings should be drawn while in Architectural Units. Earthwork (cross section, profiles, plans, maps etc.) should be drawn while in Decimal Units. If a structural drawing needs to be inserted into an earthwork drawing just insert as a block and scale by .0833333 or 1/12. By scaling you have converted it into decimal units

REINFORCING BAR WEIGHTS & SIZES

ASTM STANDARD REINFORCING BARS				
BAR SIZE designation	WEIGHT pound per foot	NOMINAL DIMENSIONS – round sections		
		diameter inches	cross sectional area- sq. inches	perimeter inches
#3	.376	.375	.11	1.178
#4	.668	.500	.20	1.571
#5	1.043	.625	.31	1.963
#6	1.502	.750	.44	2.356
#7	2.044	.875	.60	2.749
#8	2.670	1.000	.79	3.142
#9	3.40	1.128	1.00	3.544
#10	4.303	1.270	1.27	3.990
#11	5.313	1.410	1.56	4.430
#14	7.65	1.693	2.25	5.32
#18	13.60	2.257	4.00	7.09

*1

Sizes #14 and 18# are large bars generally not carried in regular stock. These sizes are available only by arrangement with the supplier.

COMMON ABBREVIATIONS

Ac-Ft .....acre feet
Approx. .....approximate
avg. .....average
B.M. .....bench mark
C.....chord length
C-C.....center-to-center
C/L .....centerline
cfs.....cubic feet per second
C.J. .....construction joint
clr. .....clear
CMP .....corrugated metal pipe
D.....degree, degree of curvature
DD°MM'SS" .degrees, minutes, seconds
Dept. .....department
Dia., Ø .....diameter
DH.....drill hole
DS .....downstream
E .....East
ea. .....each
El., Elev. .....elevation
etc. .....*et cetera* (and the like)
ft. .....foot or feetfeet
Ga. .....gage
Galv. .....galvanized
i.e. .....*id est* (that is to say)
I .....interior angle
ID .....inside diameter
in. .....inch or inches
Inv. .....invert
L .....length of curve
Lt. .....left
lb. or lbs. .....pound or pounds
LR .....land rights
Lt. .....left
Max. .....maximum
mi. .....mile
Min.....minimum
Misc. .....miscellaneous
N.....North
NMPM .....New Mexico Principal Meridian
NRCS .....Natural Resources Conservation Service
N.T.S. .....not to scale
No. .....number
P.C. .....point of curvature
Perf. .....perforated
P.I. .....point of intersection
PIP.....plastic irrigation pipe
P.T. .....point of tangent
P.S. .....principal spillway
PSI.....pounds per square inch
PVC.....polyvinylchloride
R.....Range
Rad. .....radius
RC.....reinforced concrete
RCP .....reinforced concrete pipe
Ref. .....reference
Req'd.....required
Rt. .....right
S.....South; slope
Sht. .....sheet
Sta. .....station
Std. .....standard
Sq. .....square
T .....Township; tangent of curve
TP .....test pit
Typ. .....typical
U.S. .....United States; upstream
Var. .....varies; variable
W .....West
w/ .....with
w/o.....without

= .....equal
" .....inch
' .....feet
° .....degree
@ .....at
#.....number
Δ .....delta angle

COMMON TERMINOLOGY GUIDELINES

NRCS has been known to use its own special vocabulary. Listed below are some common terms and how they are to be spelled. All drawings produced in New Mexico should follow these guidelines.

drainfill
earthfill
flood plain
flood stage
flood zone
floodwall
floodway
groundline
headgate
headwall
land rights
streambank
toewall
water rights
waterstop
wingwall

LIST OF STANDARD CALLOUTS

Approximate Existing Groundline or Approx. Existing Groundline
Channel Invert
Stripping Excavation, 0.X Average
Earthfill Pay Limits
Zone X Earthfill or Zone X Earthfill Pay Limits
Excavation Pay Limits
Zone X Rock Riprap
Geotextile
Zone X Drainfill
Base Drainage System
El.Varies, See Plan

LISTING OF FILES ON DRAFTING GUIDANCE CD

11x17shading.ctb	Used for plotting on 8½" x 11" or 11" x 17" paper
Bernalillo.dwg	Bernalillo County map
Catron.dwg	Catron County map
Chaves.dwg	Chaves County map
Cibola.dwg	Cibola County map
Colfax.dwg	Colfax County map
Computation Sheet NRCS-ENG-523A	Computation sheet in drawing format
Cover Sheet.dwg	Cover sheet format
Cross Sec Example.dwg	Cross section drawing format
Curry.dwg	Curry County map
Debaca.dwg	De Baca County map
Dona Ana.dwg	Doña Ana County map
Eddy.dwg	Eddy County map
EEO Statement	To be placed on cover sheet
Geology24X36.dwg	Geology title block format
Grant.dwg	Grant County map
Guadalup.dwg	Guadalupe County map
Harding.dwg	Harding County map
Hildalgo.dwg	Hildago County map
Lea.dwg	Lea County map
Lincoln.dwg	Lincoln County map
Losalamo.dwg	Los Alamos County map
Luna.dwg	Luna County map
Mckinley.dwg	M^{c}Kinley County map
Mora.dwg	Mora County map
New Mex Outline.dwg	Outline of New Mexico map
NM Drafting Guidance Document	This PDF document
NM with counties.dwg	Outline of state with all counties inserted
NM_County_Map.dwg	New Mexico map showing all counties
Otero.dwg	Otero County map
Plan View Example.dwg	Plan View drawing format
Quay.dwg	Quay County map
Rioarrib.dwg	Rio Arriba County map
Roosevel.dwg	Roosevelt County map
Sandoval.dwg	Sandoval County map
Sanjuan.dwg	San Juan County map
Sanmigue.dwg	San Miguel County map
Santafe.dwg	Santa Fe County map
Scales (ie.,40engr.dwg)	Miscellaneous scale drawings
Shading.ctb	Pen assignments used plotting on 24" x 36" Paper
Sierra.dwg	Sierra County map
Socorro.dwg	Socorro County map
STD Title Block.dwg	Standard NRCS title block drawing
Steel Example.dwg	Steel detail drawing format
Symbols	Miscellaneous symbol drawings (ie. North Arrow)
Taos.dwg	Taos County map
Torrance.dwg	Torrance County map
Union.dwg	Union County map
Valencia.dwg	Valencia County map

INDEX OF DRAWINGS

SHEET NUMBER	TITLE

DRAWINGS FOR THE CONSTRUCTION OF

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXX

PROJECT SPONSORED BY

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

WITH THE ASSISTANCE OF

U.S. Department of Agriculture

Natural Resources Conservation Service

XXXXXX COUNTY

NEW MEXICO

200X

PROJECT DATA

Date Bid Opened: ____________________
Contract No.: ____________ Date: ______
Contractor: ________________________
Construction Commenced: ______________
Construction Completed: ______________
Bid Price: __________________________
Final Price: _________________________
Construction Cost: ___________________

		Date
Designed	X. Xxxxxx	XX-XX
Drawn	X. Xxxxxx	XX-XX
Checked	X. Xxxxxx	XX-XX
Approved	X. Xxxxxx	XX-XX

XXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Xxxxxxx County New Mexico

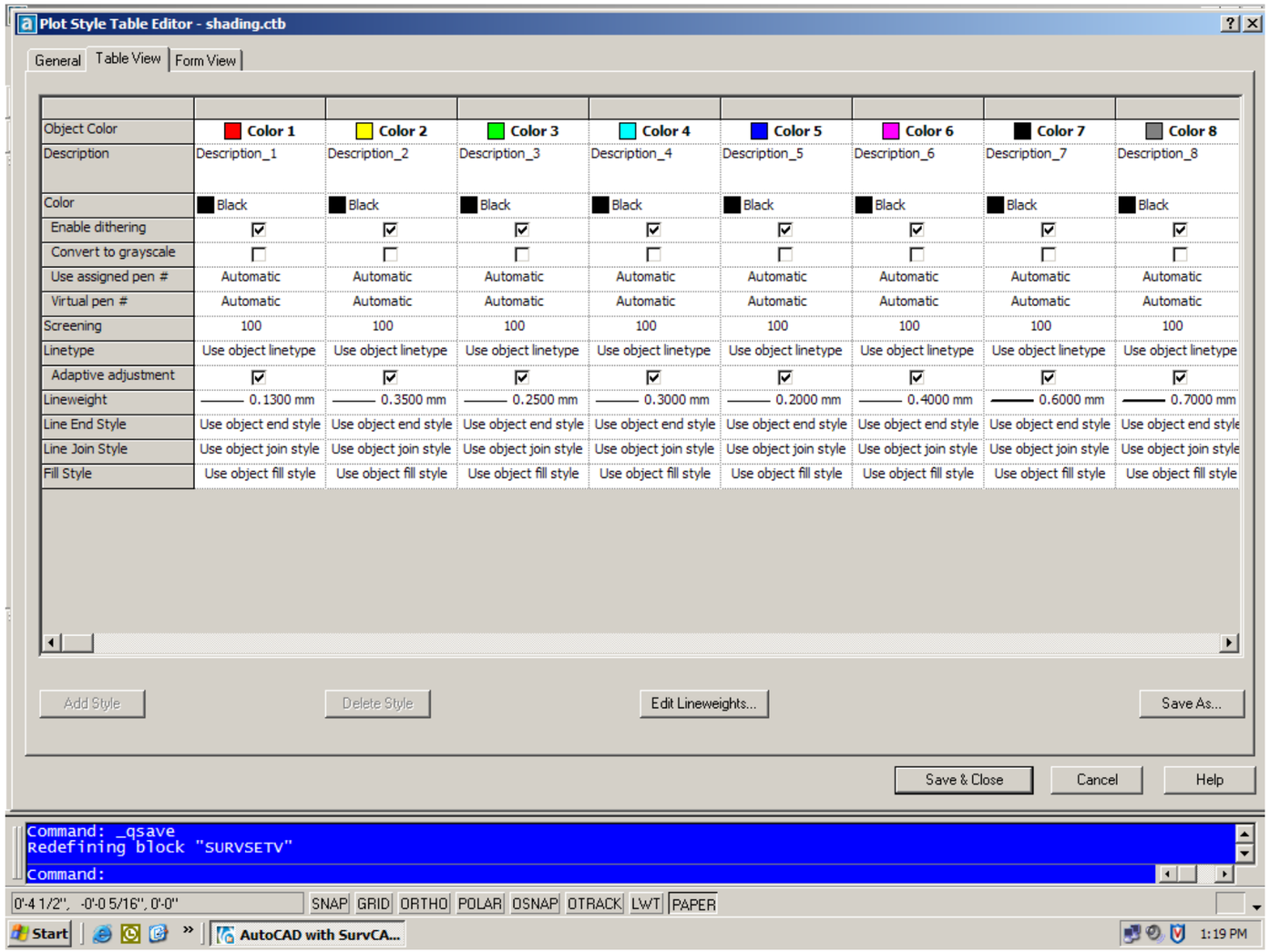
NRCS Natural Resources Conservation Service
United States Department of Agriculture

File Name

Drawing No. NM - E - XXXX

Sheet 1 of XX

This table shows a portion of the shading.ctb file. Shading.ctb is New Mexico's pen file that everyone should be using. If you need to use additional colors save your pen file to a different name. But make sure the pen file goes with the drawing file if drawing is shared with other offices.



Text size should be .1", pen color should be yellow and Romans is the font.

Text size should be .15625", pen color should be white and Romans is the font.

Text size should be .375", pen color should be yellow and CityBlueprint is the font.

Text size should be .125", pen color should be magenta and Romans is the font.

Notes:

1. Unless otherwise stated all font widths are 1.0.

Text size should be .125", pen color should be magenta and Romans is the font.

Text size should be .25" Height and .40"width. Pen color should be magenta and Romans is the font.

Text size should be .125", pen color should be magenta and Romans is the font.

Date

Designed Engineer

Drawn Draftsperson

Checked

Approved

New Mexico

XXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

PRELIMINARY

XXX County

NRCS

Natural Resources Conservation Service
United States Department of Agriculture

File Name
FILENAME

Drawing No.
NM - E -XXXX

Sheet 1 of

ARROYO NO–NAME

ARROYO 4

Current Arrow Style

Existing Major Contour – Color 252

Existing Minor Contour – Color 253

PHASE III CONSTRUCTION WORK LIMITS

CURVE NUMBER 7

44°32'56"

Sta. 610+00.00
R = 317.38

610+00

3:1

Sta. 610+72.86
El. 4342

Sta. 612+46.77

1.7%

El. 4348 level

15'-0"

40'-0"

613+12.86

El. 4342

Sta. 710+00
83.37 feet right

Sta. 710+00
6.63 feet left

49+58.25

710+00

4350

30 ft. long metal barrier @ Sta. 710+30
See Sheet 132 for Details.

DIKE 700

Scale hatch to look good with scale of drawing. Try scale of drawing as starting point.

Sta. 716+00.00
El. 4356
End of 0.045 ft./ft. slope

56°39'17"

s = 0.045 ft./ft.

Sta. 716+20.00

CURVE NUMBER 8

Sta. 718+02.93
R = 185.00

32.75

4368

3.5:1

New Major Contour – Yellow or Magenta depending on scale.
New Minor Contour – Red or Blue depending on scale.

PLAN

Scale 40 20 0 40 80 in Feet

PLAN – STATION 610+00 TO STATION 613+12.86 AND
STATION 710+00 TO STATION 718+66.80
FD–2, SITE 3C AND OUTLET 3, REACH 3
T OR C – WILLIAMSBURG ARROYOS WATERSHED

Sierra County New Mexico

		Date
Designed	M. Butler	03–02
Drawn	T.Clark	03–02
Checked	M. Butler	07–02
Approved	D. Pacheco	07–02

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

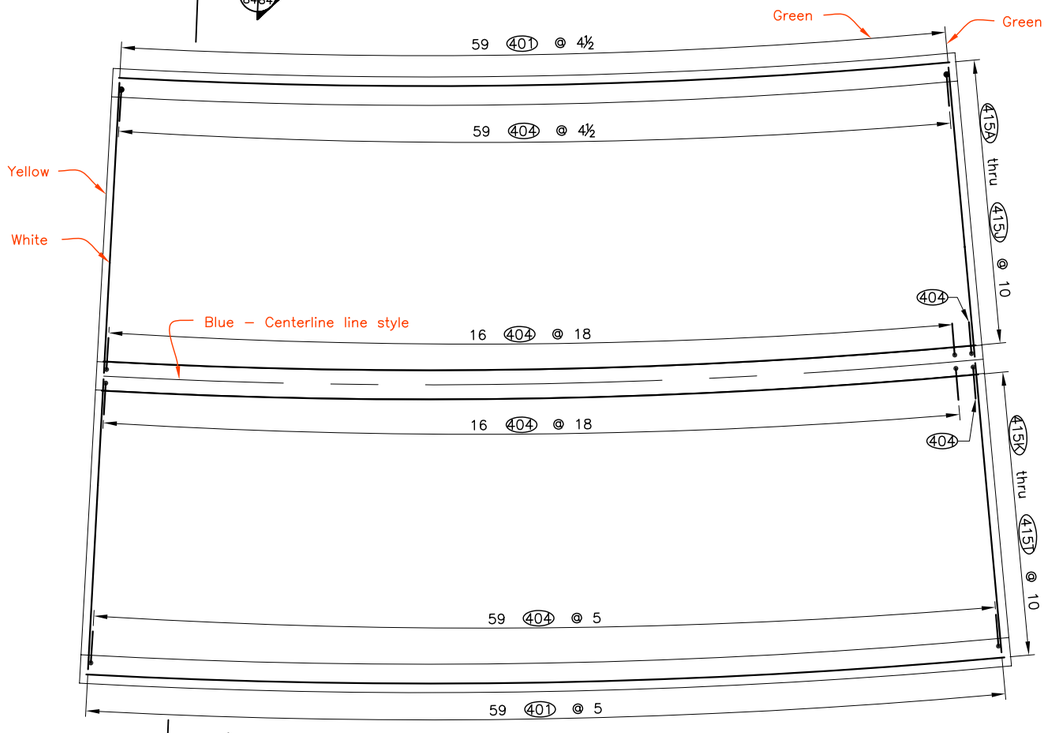
File Name
TC3600001

Drawing No.
NM – E –1225

Sheet 32 of

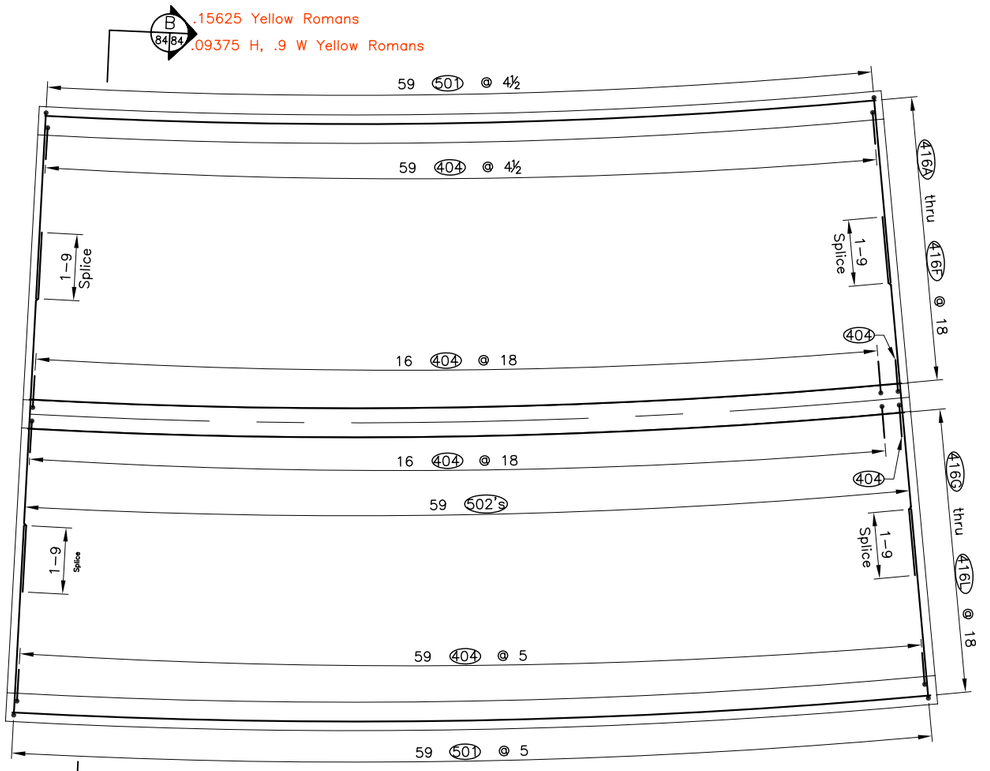
REVISION		
Date	Approved	Title
08–06–02		Changed Eyeballs

Use 1/2" eyeball when using two diget sheet numbers
Use 5/8" eyeball when using three diget sheet numbers.

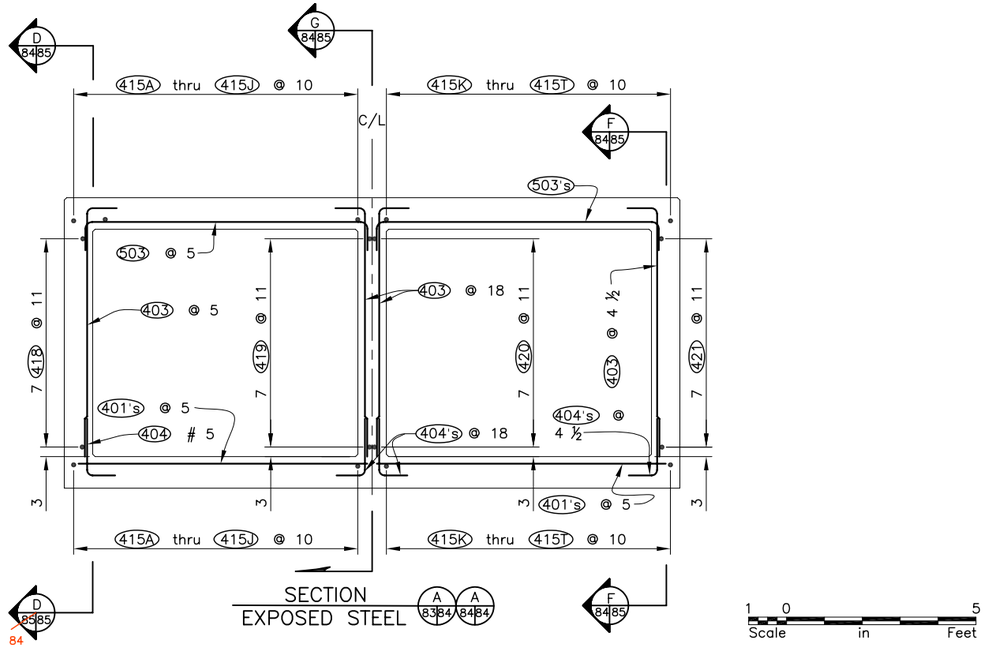


.1875 Romans Magenta

PLAN VIEW – BOTTOM SLAB
EXPOSED FACE

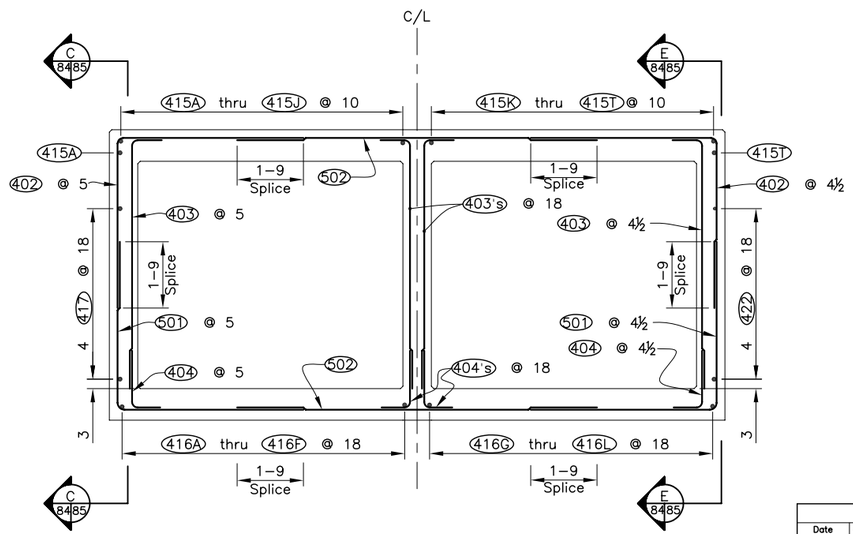


PLAN VIEW – BOTTOM SLAB
UNEXPOSED FACE



SECTION
EXPOSED STEEL A 83 84 A 84 84

1 0 5
Scale in Feet



SECTION
UNEXPOSED STEEL B 83 84 B 84 84

REVISION		
Date	Approved	Title
08-06-02		Changed Sht. No. in Eyeball
		.1 Romans Yellow

Date
Designed E. Rokni 02-02
Drawn B. Dennis 02-02
Checked M. Butler 07-02
Approved D. Pacheco 07-02

STRUCTURE REINFORCEMENT FROM STATION 77+18.40 TO STATION 77+41.90
FD-2, SITE 3C AND OUTLET 3, REACH 3
T OR C – WILLIAMSBURG ARROYOS WATERSHED
BOX CONDUIT

Sierra County New Mexico

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name TC3BCDS016

Drawing No. NM - E -1225

Sheet 84 of

Sample NRCS Line Styles

Sample Line (AutoCAD linetypes)	Line Use
	A Solid Line for most drawing purposes (color 2 yellow)
	Bank lines in a profile view (color 3 green)
	Borders of unknown type (color 6 magenta)
	Center line of structure in a plan view or alignment (color 1 red)
	Hidden line in all views (color 3 green)
	National or State Line (color 2 yellow)
	Phantom lines in all views (color 1 red)
	Stream flow line (color 2 yellow or 4 cyan)
	Construction Work Limits (color 7 white)
	Gravel, graded dirt road (color 4 cyan)
	Unimproved dirt road (color 4 cyan)
	Short break line (color 7 white or 6 magenta)
	Border (color 9)
	Cutting Plane (color 7 white)
	Index Countours (color 252)
	Intermediate Countours (color 253)
(linetypes created by other means)	
	Power transmission line (color 3 green or 4 cyan)
	Existing fences in a plan view (color 3 green)
	Railroad tracks (color 2 yellow or 4 cyan)
	Buried pipeline (label) (color 2 yellow)
	Paved primary road (color 2 yellow or 4 cyan)
	Long break line (color 4 cyan)

Please note the suggested colors to be used only apply when using the shading.ctb pen file as the default for drawings.

LEGEND

SYMBOLS

UNCONSOLIDATED MATERIAL

GP gravel | SP sand | ML silt | CL clay | cobbles

gravel,sandy | sand,gravelly | silt,gravelly | clay,gravelly | peat

gravel,silty | sand,gravelly silty | silt,sandy | clay,sandy | gypsiferous

GC gravel,clayey | sand,clayey | silt,clayey | clay,silty | calcareous

gravel,sandy silty | SM sand,silty clayey | organic silt | organic clay | auger

CONSOLIDATED MATERIAL

Sedimentary Rocks

Sh shale | Ss sandstone | limestone | chalk | coal

calcareous shale | calcareous sand | cherty limestone | marl | gypsum

sandy shale | shaley sand | sandy lime | chert | conglomerate

Ms siltstone | breccia | dolomite | Cs claystone |

Metamorphic Rocks

quartzite | slate

gneiss | schist

marble | soapstone

Igneous Rocks

intrusive | extrusive

pyroclastic

Undifferentiated

undiffer

OTHER SYMBOLS

- Test Hole Unsampled
- Test Hole Sampled
- Dip and Strike
- Pit or Trench
- Pit or Trench Sample
- #1 Sample
- Transition from one material to another.

TEST HOLE NUMBERING SYSTEM

	Drill Rig Borings	Hand Borings	Trench Excavations	Natural Excavations
Centerline of Dam	1–99	1001–1099	2001–2099	3001–3099
Borrow Area	101–199	1101–1199	2101–2199	3101–3199
Emergency Spillway	201–299	1201–1299	2201–2299	3201–3299
Principal Spillway	301–399	1301–1399	2301–2399	3301–3399
Stream Channel	401–499	1401–1499	2401–2499	3401–3499
Relief Wells	501–599	1501–1599	2501–2599	3501–3599
Foundation Drains	601–699	1601–1699	2601–2699	3601–3699
Miscellaneous	701–799	1701–1799	2701–2799	3701–3799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW well graded gravel; gravel–sand mixtures
GP poorly graded gravels
GM silty gravels; gravel–sand–silt mixtures
GC clayey gravels; gravel–sand–clay mixtures
SW well graded sands; sand–gravel mixtures
SP poorly graded sands
SM silty sand; silt–sand mixtures
SC clayey sand; clay–sand mixtures
ML silt, silt mixtures, low plasticity
MH clay, clay mixtures, high plasticity
CL clay, clay mixtures, low plasticity
CH clay, clay mixtures, high plasticity
OL organic matter, organic mixtures, low plasticity
OH organic matter, organic mixtures, high plasticity

Dual symbols – Any combination of two of the above;the dominant fraction to be used first

Date

Designed

Drawn

Checked

Approved

New Mexico

XXXXXXXXXXXXXXXX
XXXXXXXXXXXXX
XXXXXXXXXXXXX
XXXXXXXXXXXXXXXX

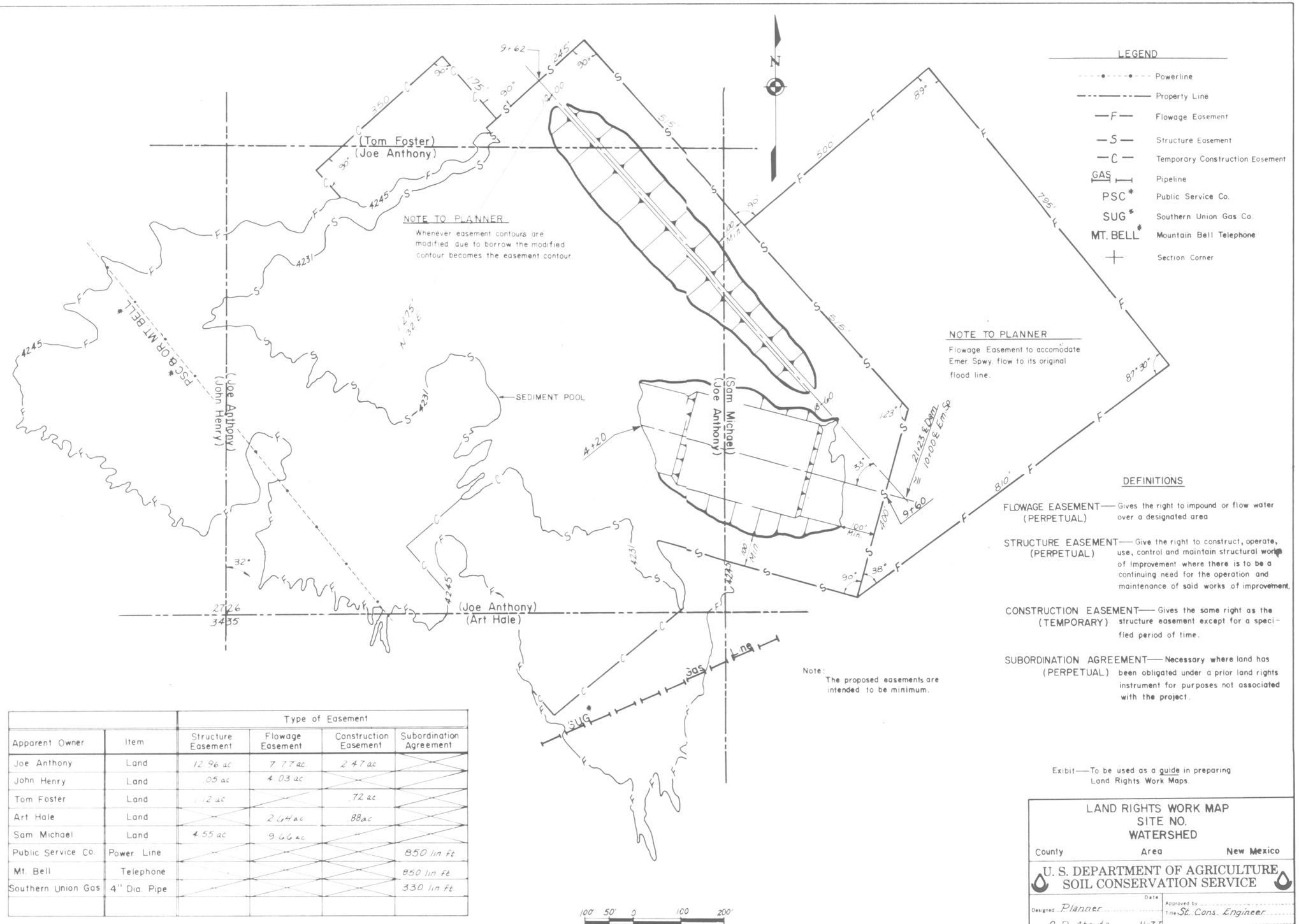
Xxxxxx County

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name
XXXXXXXXXXX

Drawing No.
NM - E - XXXX

Sheet X **of**



		Type of Easement			
Apparent Owner	Item	Structure Easement	Flowage Easement	Construction Easement	Subordination Agreement
Joe Anthony	Land	12.96 ac	7.77 ac	2.47 ac	
John Henry	Land	.05 ac	4.03 ac		
Tom Foster	Land	.12 ac		.72 ac	
Art Hale	Land		2.64 ac	.88 ac	
Sam Michael	Land	4.55 ac	9.66 ac		
Public Service Co.	Power Line				850 lin ft.
Mt. Bell	Telephone				850 lin ft.
Southern Union Gas	4" Dia. Pipe				330 lin ft.

Note:
The proposed easements are intended to be minimum.

DEFINITIONS

FLOWAGE EASEMENT (PERPETUAL) — Gives the right to impound or flow water over a designated area

STRUCTURE EASEMENT (PERPETUAL) — Give the right to construct, operate, use, control and maintain structural works of improvement where there is to be a continuing need for the operation and maintenance of said works of improvement.

CONSTRUCTION EASEMENT (TEMPORARY) — Gives the same right as the structure easement except for a specified period of time.

SUBORDINATION AGREEMENT (PERPETUAL) — Necessary where land has been obligated under a prior land rights instrument for purposes not associated with the project.

Exibit — To be used as a guide in preparing Land Rights Work Maps.

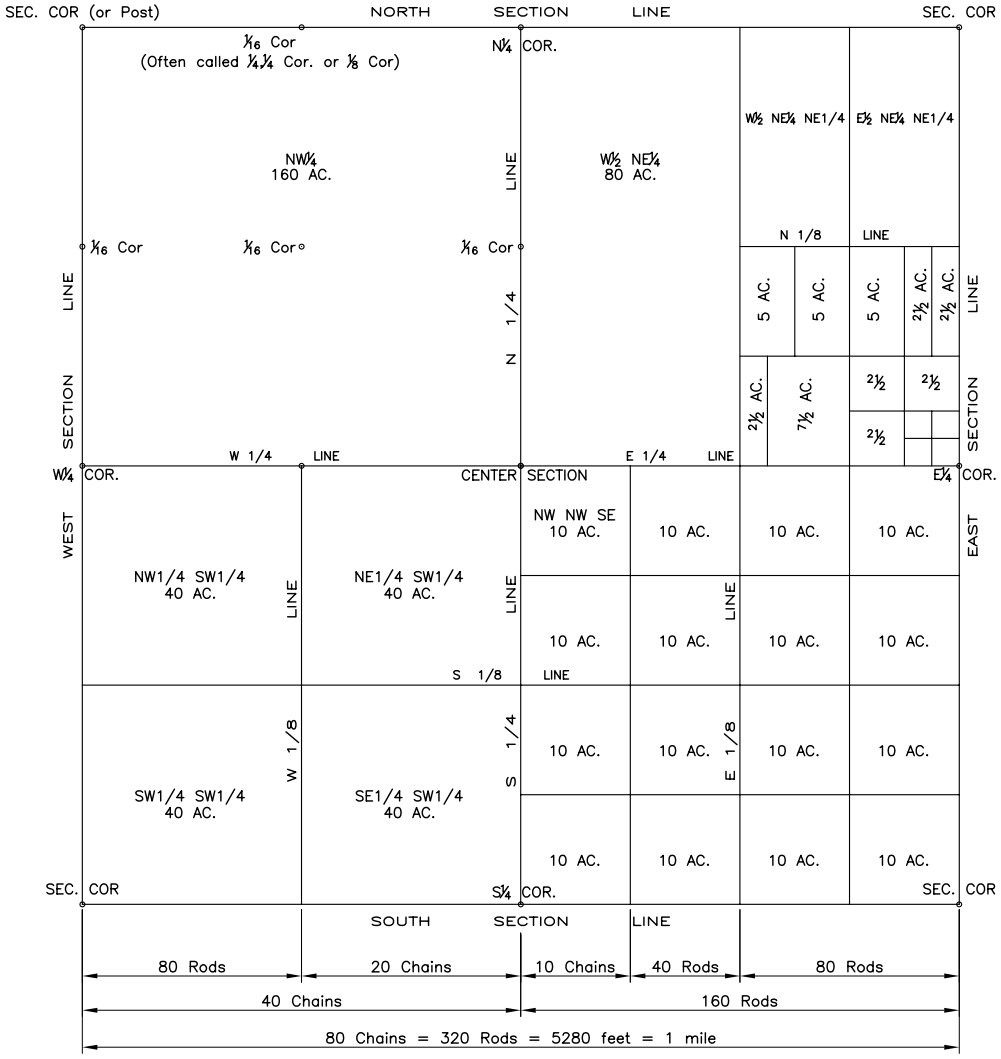
LAND RIGHTS WORK MAP
SITE NO.
WATERSHED
County Area New Mexico

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed Planner Date
Drawn C. R. Abeyta 11-7-7
Traced
Checked
Approved by
Title St. Cons. Engineer
Title State Conservationist
Sheet No. 1 of 1
Drawing No

AMENDMENT No. 1	Name	Date
	Name	Date

Section of Land : 640 Acres
(Showing Minor Subdivisions & Corners)



UNITS OF MEASUREMENT – Survey & Maps

GUNTER'S CHAIN UNITS & EQUIVALENTS

80 Chains = 1 Mlle
1 Chain = 100 Links
1 Chain = 4 Rods
1 Chain = 66 Feet
10 Sq. Ch. = 1 Acre
1 Link = 7.92 Inches

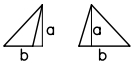
OTHER UNITS OF MEASUREMENT

320 Rods = 1 Mile
1 Rod = 25 Links
1 Rod = 1/4 Chain
1 Rod = 16 1/2 Feet
1 Rod = 5 1/2 Yards
160 Sq. Rods = 1 Acre
43,560 Sq. Ft. = 1 Acre
1 Rod = 1 Pole = 1 Perch
1 Vara (Texas) = 33,333 Inches
1 Statue Mile = 5,280 Feet = 320 Rods = 8 Furlongs
1 U.S. Nautical Mile (Geographical or Sea) = 6,080.20 Feet
1 Furlong = 1/8 Mile = 40 Rods = 220 Yards = 660 feet
1 Fathom = 6 Feet = 8 Spans
1 Meter =39.37 Inches = 3.28 Feet
1 Mill = 1/1000 (or 0.001) Inches
An Acre = Parcel of ground about 208 Feet Square
1 Township (Std. Sec.) = 36 Square Miles = 23,040 Acres
1 Section (Std. Sec.) = 1 Square Mile = 640 Acres

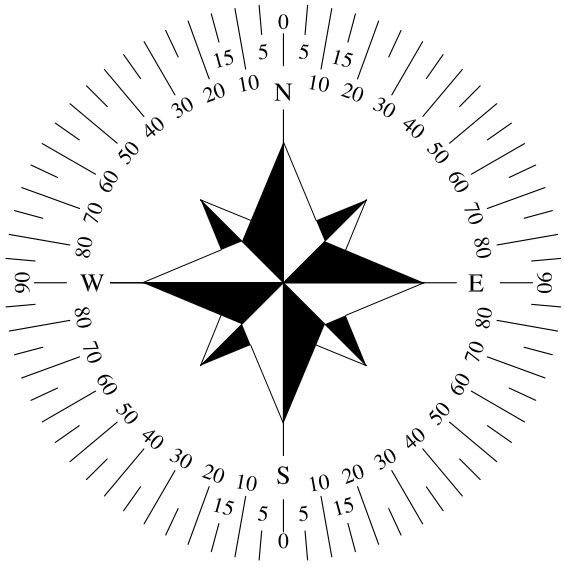
CUBIC MEASURE

1,728 Cu. In. – 1 Cu Ft.
27 Cu. Ft. – 1 Cu. Yd.
1 Liquid Gal. – 231 Cu. In.
1 Dry Gal. – 268.8 Cu. In.
1 Cu. Ft. – 6.428 Dry Gal.
1 Cord – 4x4x8 Ft. – 128 Cu. Ft.

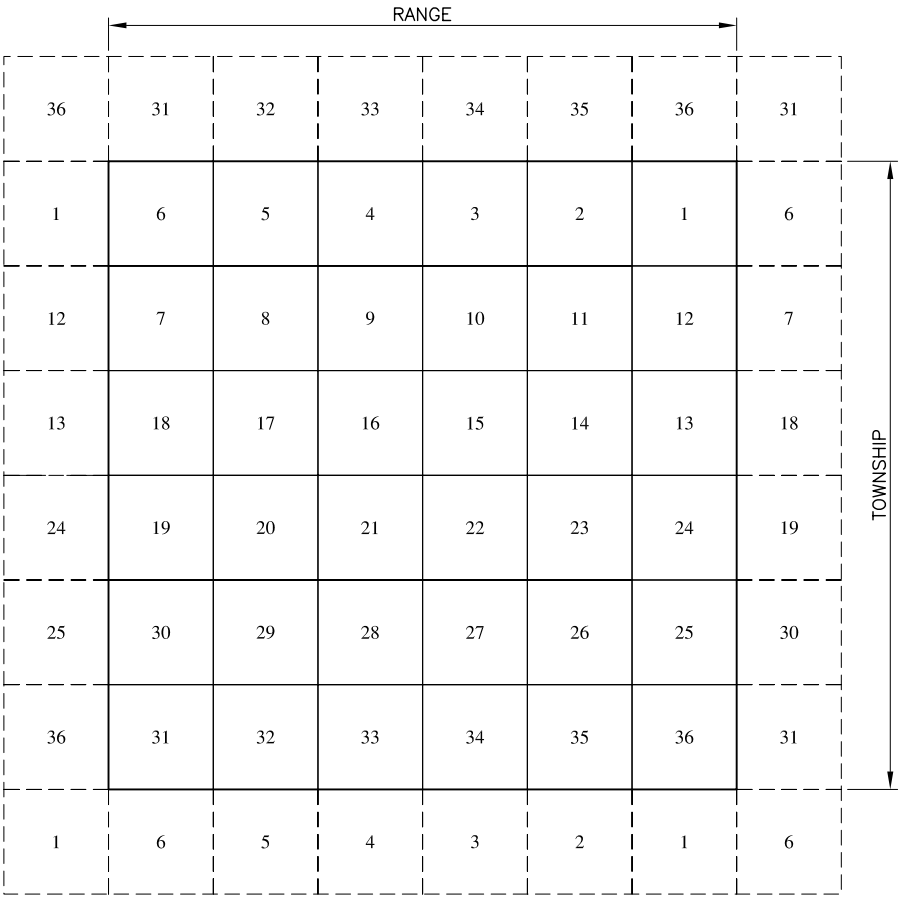
Area of Rectangle = Base x Altitude 

Area of Triangle = 1/2 Base x Altitude 

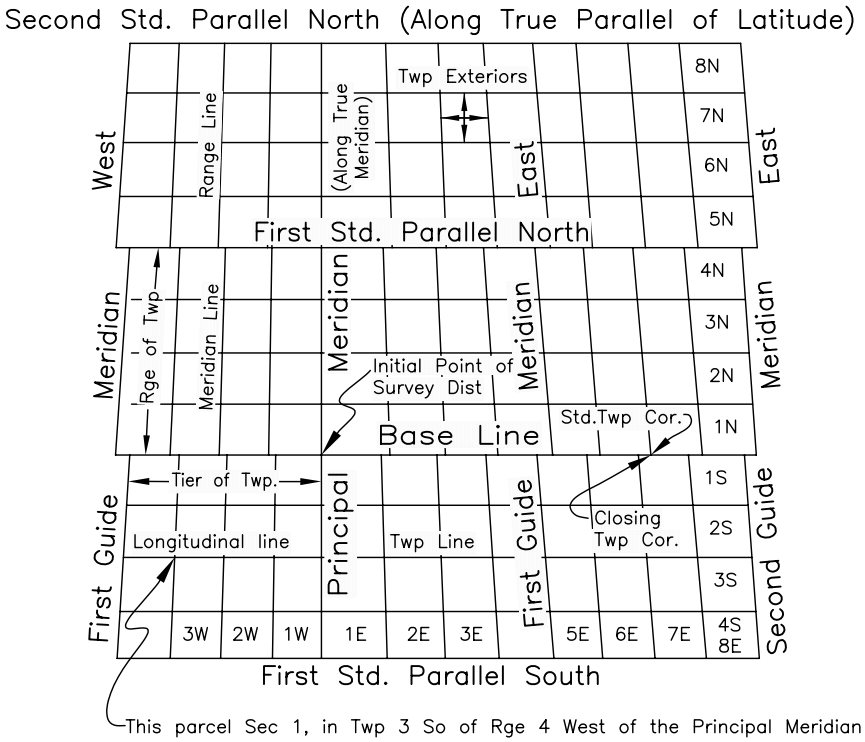
Area of Trapezoid = $\frac{b+c}{2}$ x a 



BEARINGS
As Used in Descriptions



STANDARD TOWNSHIP PLAT



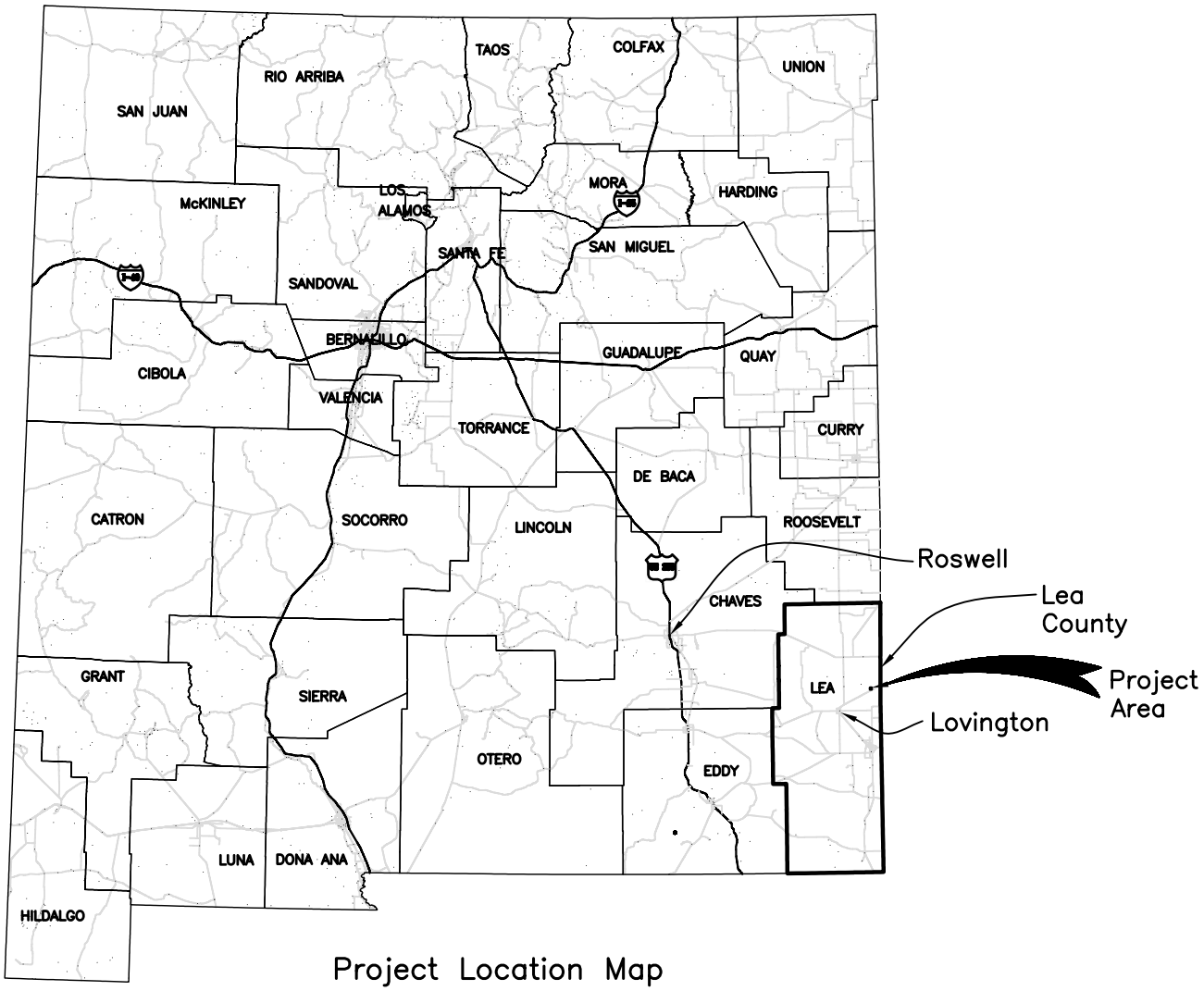
TOWNSHIP AND RANGE NUMBERING

NATIONAL MAP SYMBOL HANDBOOK

TITLE 170 PART 601

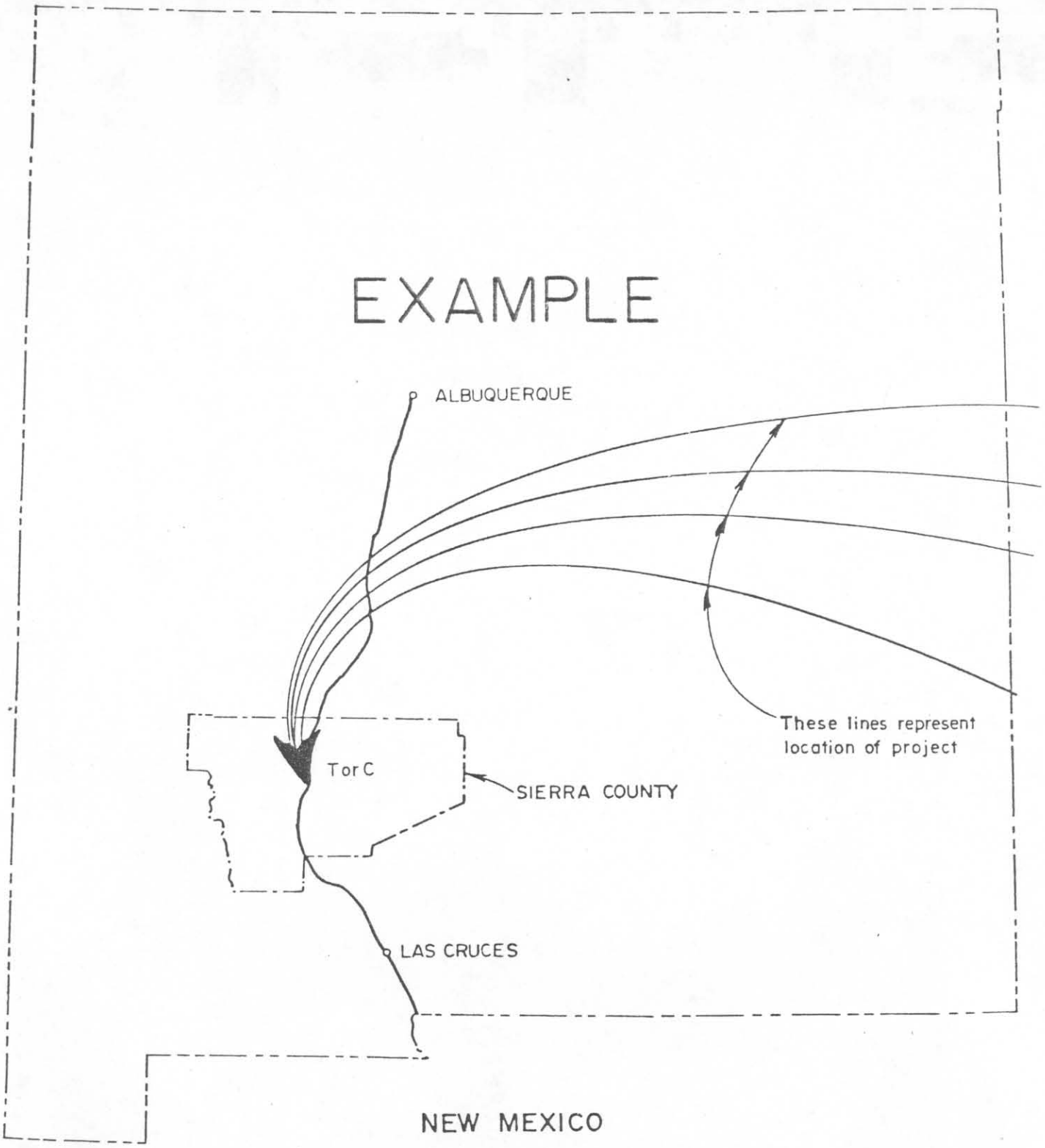
BM–1 EL 100.00 NORTH EAST BENCH MARK bmark.dwg	CP–2 EL 98.76 NORTH EAST CONTROL PT HORIZONTAL cp–hor.dwg	CP–3 EL 98.76 NORTH EAST CONTROL PT HOR/VER cp–horver.dwg	CP–4 EL 98.76 NORTH EAST CONTROL PT VERTICAL cp–ver.dwg	SIGN sign.dwg	
I–84 ROAD INTERSTATE road–int.dwg	234 ROAD FEDERAL road–fed.dwg	190 ROAD STATE road–st.dwg	WET SPOT wetspot.dwg	SWAMP swamp.dwg	
PLANNED SPRING DEV sprgdev.dwg	EXISTING SPRING DEV sprgdev–x.dwg	SPRING spring.dwg	PLANNED SPRING/TROUGH sprgtrof.dwg	EXISTING SPRING/TROUGH sprgtrof–x.dwg	
PLANNED PIPE RISER riser.dwg	EXISTING PIPE RISER riser–x.dwg	PLANNED PUMP pump.dwg	EXISTING PUMP pump–x.dwg	PLANNED TROUGH trough.dwg	EXISTING TROUGH trough–x.dwg
WELL PLANNED WELL well.dwg	WELL EXISTING WELL well–x.dwg	IRRIGATION WELL well–irr.dwg	ARTESIAN WELL well–art.dwg	EXISTING TILE DRAIN tiledrn.dwg	
AH–3 EXISTING AUGER HOLE aghole.dwg	DH–4 EXISTING DRILL HOLE drhole.dwg	TP–5 EXISTING TEST PIT testpit.dwg	WATER TANK PLANNED WATER TANK wtank.dwg	WATER TANK EXISTING WATER TANK wtank–x.dwg	

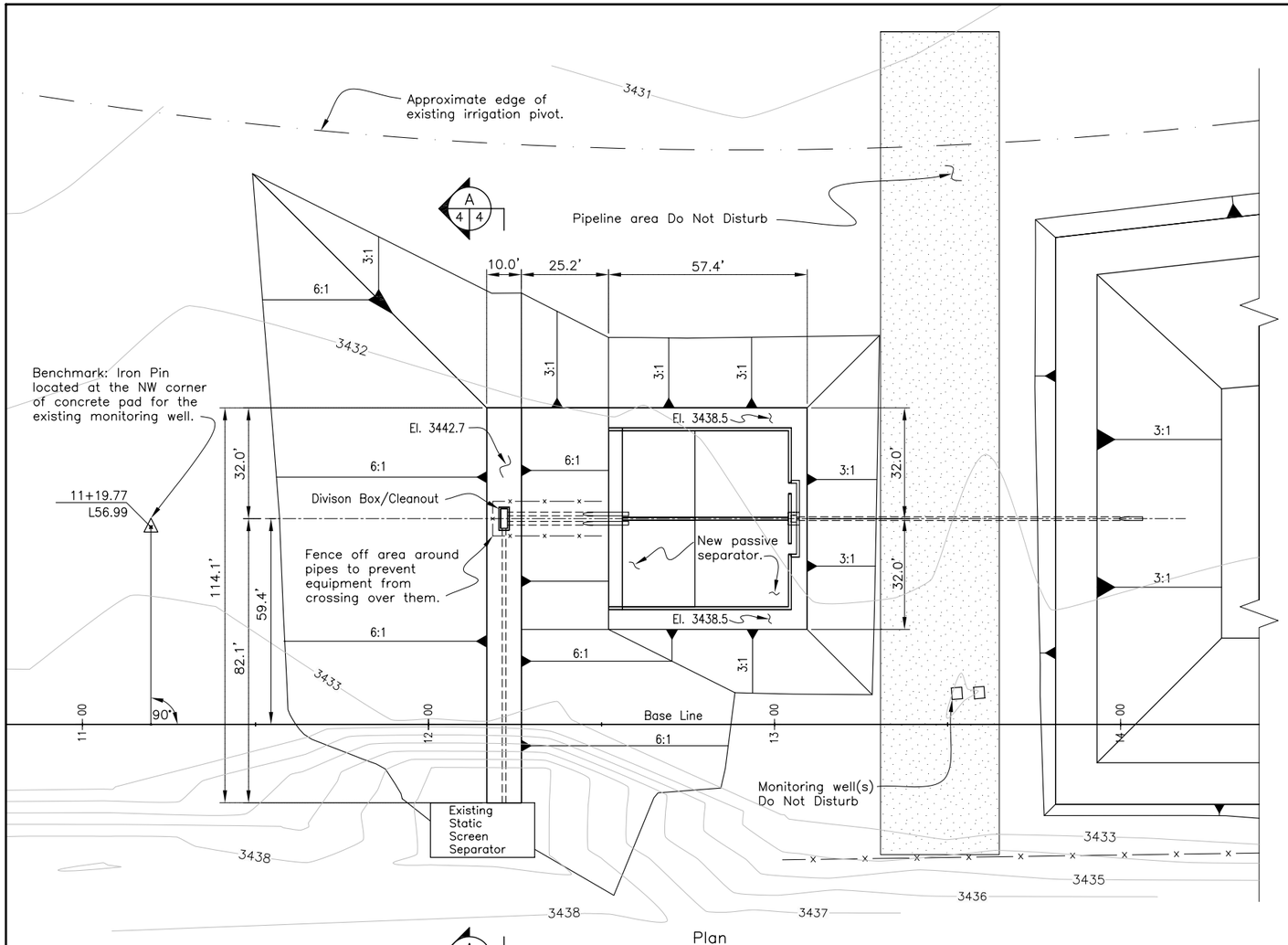
MAPSYM.DWG
FEB 2001



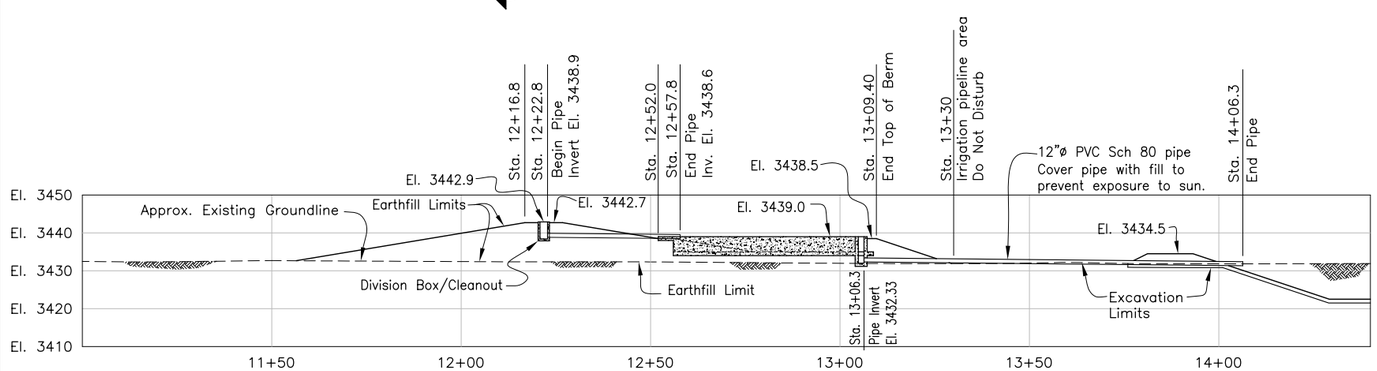
Project Location Map

N.T.S.

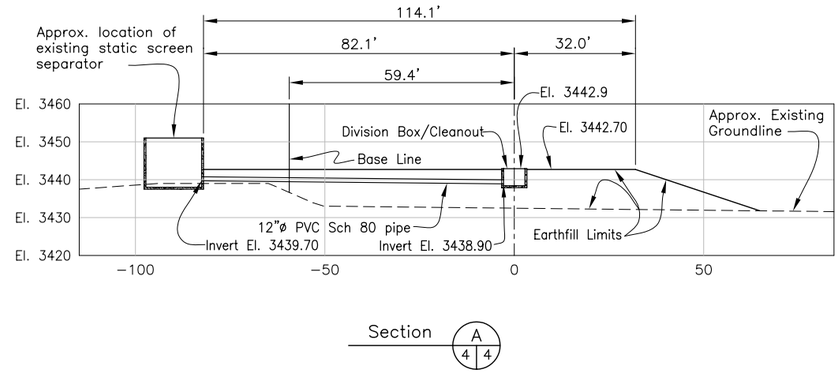

EXAMPLE
ALBUQUERQUE
These lines represent location of project
T or C
SIERRA COUNTY
LAS CRUCES
NEW MEXICO



Plan



C/L Profile



Section A 4 4

20 10 0 20 40
Scale in Feet

Signed & Sealed
by David J. Pacheco, SCE
Licensed Professional Engineer
10737
February 4, 2005

Date	
Designed	09-2004
Drawn	09-2004
Checked	01-2005
Approved	01-2005

New Mexico

PLAN & PROFILE
DIVISION BOX / CLEANOUT
VAZ DAIRY

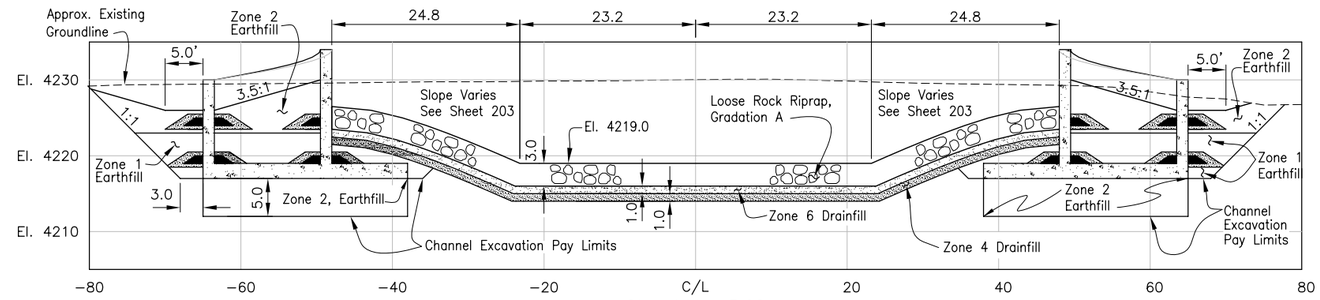
Chaves County

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

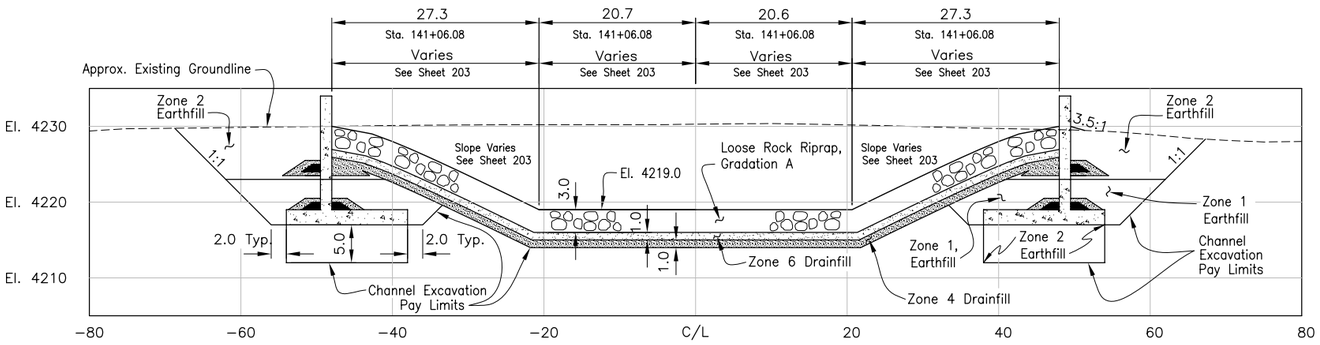
File Name VAZ_Dairy

Drawing No. NM - E -1306

Sheet 4

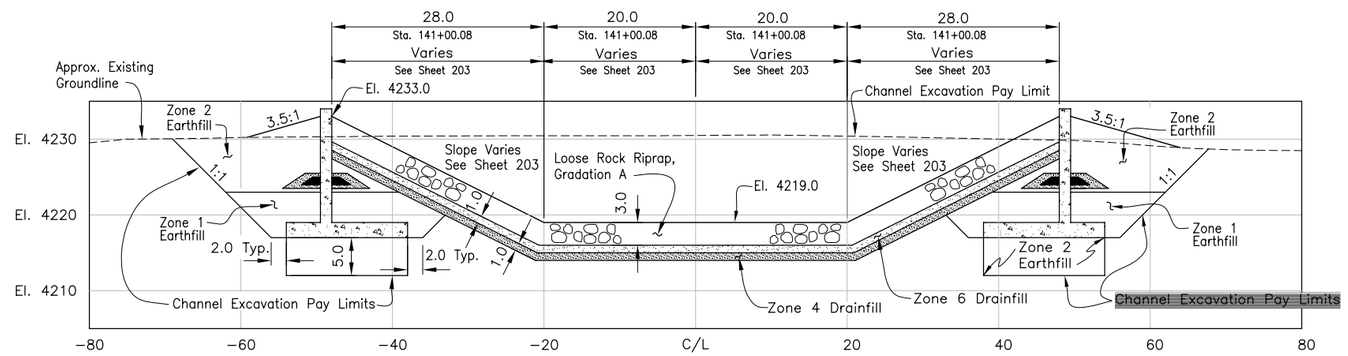


Sta. 141+13.08



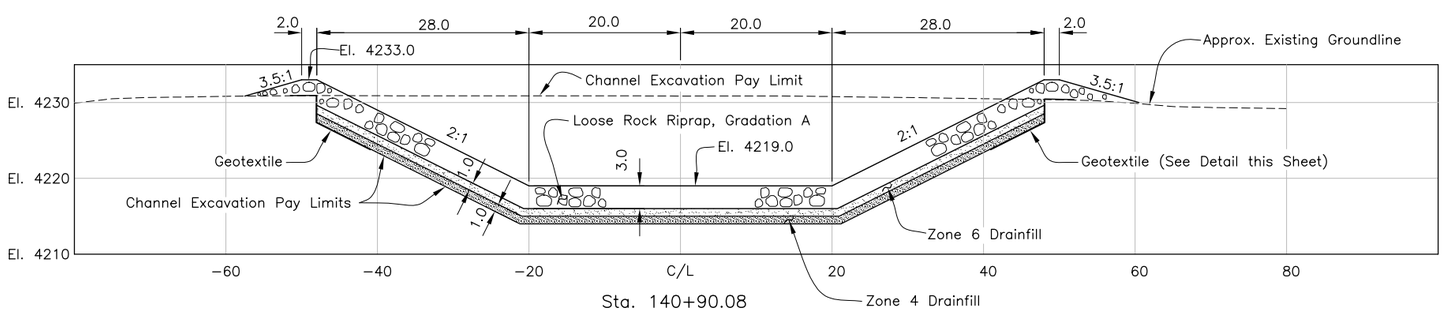
Sta. 141+06.08

Typical Cross Section – From Sta. 141+06.08 to Sta. 141+13.08



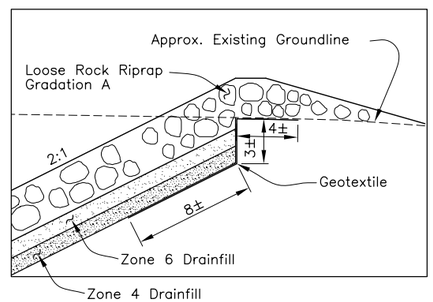
Sta.141+00.08

Typical Cross Section – From Sta. 141+00.08 to Sta. 141+06.08



Sta. 140+90.08

Typical Cross Section – From Sta. 140+90.08 to Sta. 141+00.08



Geotextile Detail B

10 5 0 10 20
Scale in Feet

Date
Designed M. Butler — 11–02
Drawn M. Butler & J. Roll — 12–02
Checked M. Butler — 07–03
Approved D. Pacheco — 07–03

REACH 1 CROSS SECTIONS
OUTLET 3, REACH 1 AND CHANNEL 200
T OR C – WILLIAMSBURG ARROYOS WATERSHED

Sierra County New Mexico

USDA NRCS Natural Resources Conservation Service

File No. TC3P403R1Prof

Drawing No. NM – E –1283

Sheet 209

STRUCTURAL DESIGN: REINFORCED CONCRETE DESIGN
WORKING STRESS DESIGN
DEVELOPMENT LENGTHS

Development Length, inches										
Description	Class of Concrete	Bar Size								
		#3	#4	#5	#6	#7	#8	#9	#10	#11
Tension Top Bars	5000	12	12	14	17	20	25	32	40	49
	4000	12	12	14	17	21	28	35	45	55
	3000	12	12	14	18	25	32	41	52	64
	2500	12	12	14	20	27	36	45	57	70
All Other Tension Bars	5000	12	12	12	12	14	18	23	29	35
	4000	12	12	12	12	15	20	25	32	40
	3000	12	12	12	13	18	23	29	37	46
	2500	12	12	12	14	19	25	32	41	50
All Compression Bars	5000	8	8	8	9	11	12	14	16	17
	4000	8	8	8	10	11	13	15	16	18
	3000	8	8	9	11	13	15	16	18	20
	2500	8	8	10	12	14	16	18	20	22

Notes:

(a) Development lengths are given for design yield strength. f_y = 40 ksi

(b) Tension bars spaced laterally not less than 6 inches on center, and bars with at least 3 inches clear from face of member to first bar may use 0.8 development lengths shown but not less than 12 inches.

(c) See ES-227, sheet 3 of 3 for lapped splice lengths.

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING DIVISION - DESIGN SECTION	STANDARD DWG. NO. ES-160 SHEET 3 OF 3 DATE 7-64

Revised 8-80

STRUCTURAL DESIGN: Reinforced Concrete Design
Strength Design
Lap Splices in Reinforcement

Lapped Splice Lengths, inches											
Grade of Steel	Description	Class of Concrete	Class of Splice	Bar Size							
				#3	#4	#5	#6	#7	#8	#9	#10	#11
40	Tension Top Bars	6000	A	12	15	19	23	27	30	34	38	46
			B	16	16	19	23	27	30	38	48	59
			C	21	21	24	29	34	39	50	63	77
		5000	A	12	15	19	23	27	30	34	41	50
			B	16	16	19	23	27	33	42	53	65
			C	21	21	24	29	34	43	54	69	85
		4000	A	12	15	19	23	27	30	36	45	56
			B	16	16	19	23	28	37	47	59	72
			C	21	21	24	29	37	48	61	77	95
		3000	A	12	15	19	23	27	33	41	52	64
			B	16	16	19	24	32	43	54	68	83
			C	21	21	24	31	42	55	70	89	109
		2500	A	12	15	19	23	27	36	45	57	70
			B	16	16	19	26	35	47	59	74	91
			C	21	21	24	34	46	61	77	97	119
	All Other Tension Bars	6000	A	12	15	19	23	27	30	34	38	42
			B	16	16	19	23	27	30	34	38	42
			C	21	21	21	23	27	30	36	45	55
		5000	A	12	15	19	23	27	30	34	38	42
			B	16	16	19	23	27	30	34	38	46
			C	21	21	21	23	27	31	39	49	61
		4000	A	12	15	19	23	27	30	34	38	42
			B	16	16	19	23	27	30	34	42	52
			C	21	21	21	23	27	34	44	55	68
		3000	A	12	15	19	23	27	30	34	38	46
			B	16	16	19	23	27	31	38	49	60
			C	21	21	21	23	30	40	50	64	78
		2500	A	12	15	19	23	27	30	34	41	50
			B	16	16	19	23	27	33	42	53	65
			C	21	21	21	24	33	44	55	70	85
	All Compression Bars	6000		12	12	15	18	21	24	27	30	33
		5000		12	12	15	18	21	24	27	30	33
		4000		12	12	15	18	21	24	27	30	33
		3000		12	12	15	18	21	24	27	30	33
		2500		16	16	20	24	28	32	36	40	44

Tension bars spaced laterally not less than 6 inches on center, and bars with at least 3 inches clear from face of member to first bar may use 0.8 lap lengths shown but not less than 12 inches.

REFERENCE	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING DIVISION - DESIGN UNIT	STANDARD DWG. NO. ES - 227 SHEET 3 OF 3 DATE 12-79

*U.S. GOVERNMENT PRINTING OFFICE : 1981 O-340-931/SCS-362

STRUCTURAL DESIGN: REINFORCED CONCRETE DESIGN
WORKING STRESS DESIGN
ANCHORAGE LENGTHS AND SPLICE LENGTHS

Anchorage Length, inches

Description	Class of Concrete	Bar Size								
		#3	#4	#5	#6	#7	#8	#9	#10	#11
Tension Top Bars	5000	6	8	9	12	16	21	27	33	40
	4000	6	8	10	14	18	24	30	37	44
	3000	6	8	11	16	21	27	35	42	51
	2500	6	8	12	17	23	30	38	46	56
All Other Tension Bars	5000	4	5	7	9	12	15	19	23	28
	4000	4	5	7	10	13	17	21	26	32
	3000	4	5	8	11	15	19	24	30	36
	2500	4	6	9	12	16	21	27	33	40
All Compression Bars	5000	5	7	8	10	11	13	15	16	18
	4000	5	7	8	10	11	13	15	16	18
	3000	6	8	9	11	13	15	16	18	20
	2500	6	8	10	12	14	16	18	20	22

Lapped Splice Length, inches

Description	Class of Concrete	Bar Size								
		#3	#4	#5	#6	#7	#8	#9	#10	#11
Tension Top Bars	5000	12	15	19	23	27	30	35	44	53
	4000					27	31	40	49	59
	3000					28	36	46	56	68
	2500					30	40	50	62	74
All Other Tension Bars	5000	12	15	19	23	27	30	34	38	42
	4000							34	38	42
	3000							34	40	48
	2500							36	44	53
All Compression Bars	ALL	12	12	15	18	21	24	27	30	33

Tension Splice

L = the larger of $\frac{f_s D}{4(\frac{3}{4}u)}$ or 30D

Compression Splice

L = the larger of 24D or 12 inches

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING DIVISION - DESIGN SECTION	STANDARD DWG. NO. ES-160 SHEET 3 OF 3 DATE 7-64

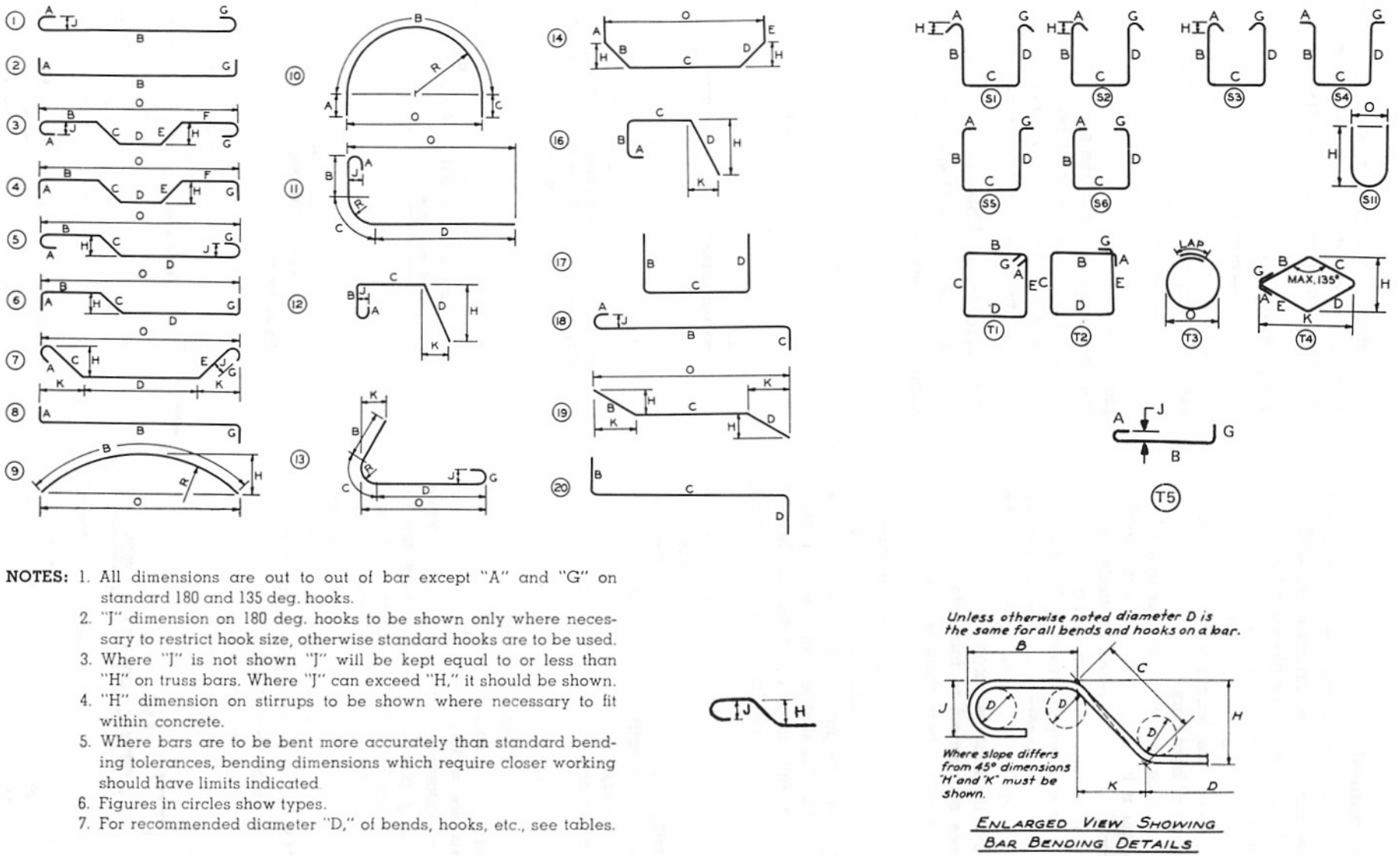
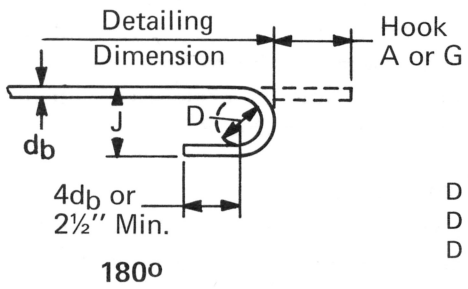


Fig. 2-2—Typical bar bends

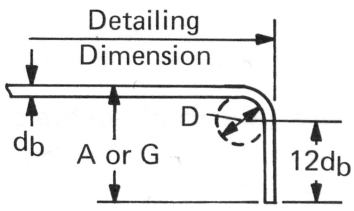
TABLE 2-1—STANDARD HOOK DETAILS



180°

D = Bend diameter

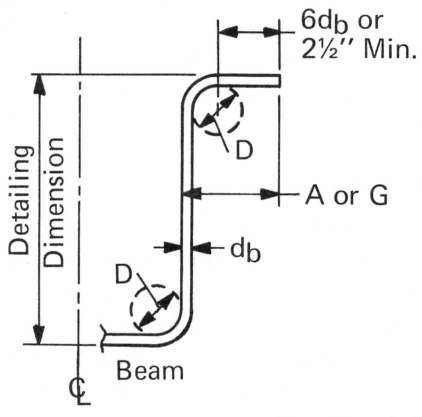
D = $6d_b$ for #3 through #8
D = $8d_b$ for #9, #10 and # 11
D = $10d_b$ for #14 and #18



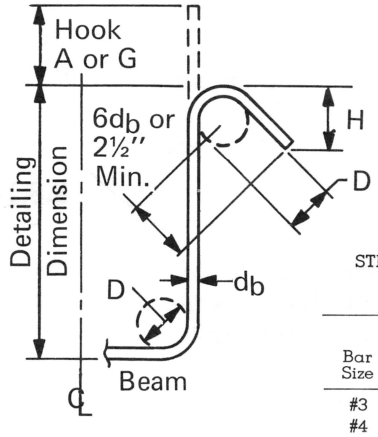
90°

Bar size	Dimensions of standard 180-deg hooks, all grades			Dimensions of standard 90-deg hooks, all grades	
	A or **G**	**J**	**D**	**A** or **G**	**D**
#3	5"	3"	2¼"	6"	2¼"
#4	6	4	3	8	3
#5	7	5	3¾	10	3¾
#6	8	6	4½	1'-0"	4½
#7	10	7	5¼	1-2	5¼
#8	11	8	6	1-4	6
#9	1'-3"	11¼	9	1-7	9
#10	1-5	1'-0¾"	10¼	1-10	10¼
#11	1-7	1-2¼	11¼	2-0	11¼
#14	2-2	1-8½	17	2-7	17
#18	2-11	2-3	22¾	3-5	22¾

NOTE: When available depth is limited, #3 through #11 Grade 40 bars having 180-deg hooks may be bent with D=$5d_b$ and correspondingly smaller A and J dimensions.



90°



135°

D = Bend diameter

Stirrup Hooks

(Tie Bends Similar)

STIRRUP AND TIE HOOK DIMENSIONS (in.)

Grades 40-50-60 ksi

Bar Size	D	90° Hook	135° Hook	
		Hook A or G	Hook A or G	H Approx.
#3	1½	4	4	2½
#4	2	4½	4½	3
#5	2½	6	5½	3¾

NOTE: 135-deg column tie hooks may not be bent to less than diameter of column vertical bar enclosed in hook.

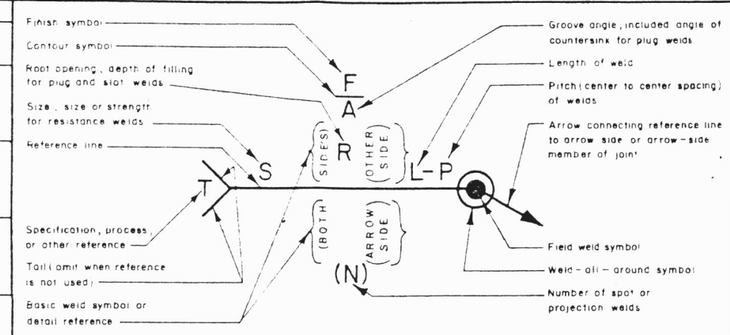
HOOKS AND BENDS OF WELDED WIRE FABRIC

Inside diameter of bends in welded wire fabric, plain or deformed, for stirrups and ties shall be at least four wire diameters for wire larger than D6 or W6 and two wire diameters for all other wires. Bends with inside diameter of less than eight wire diameters shall not be less than four wire diameters from nearest welded intersection.

BASIC WELDING SYMBOLS

LOCATION SIGNIFICANCE	ARC AND GAS WELDING SYMBOLS								RESISTANCE WELDING SYMBOLS			
	BEAD	FILLET	PLUG OR SLOT	GROOVE: SQUARE	GROOVE: V	GROOVE: BEVEL	GROOVE: U	GROOVE: J	PROJECTION	SPOT	SEAM	FLASH OR UPSET
ARROW SIDE	(GROOVE WELD SYMBOL)									NOT USED	NOT USED	NOT USED
OTHER SIDE	(GROOVE WELD SYMBOL)									NOT USED	NOT USED	NOT USED
BOTH SIDES	NOT USED		NOT USED						NOT USED	NOT USED	NOT USED	NOT USED
NO ARROW-SIDE OR OTHER SIDE SIGNIFICANCE		NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED			

LOCATION OF ELEMENTS OF A WELDING SYMBOL

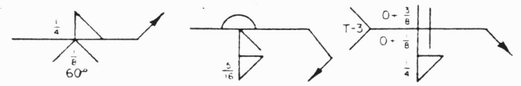


TYPICAL WELDING SYMBOLS

BEAD WELD SYMBOL INDICATING BEAD TYPE BACK WELD

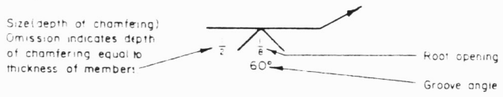
STAGGERED INTERMITTENT-FILLET WELDING SYMBOL

WELDING SYMBOLS FOR COMBINED WELDS

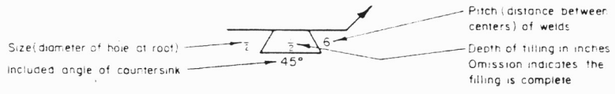


DUAL BEAD WELD SYMBOL INDICATING BUILT-UP SURFACE

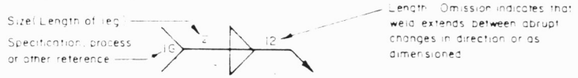
SINGLE-V GROOVE WELDING SYMBOL



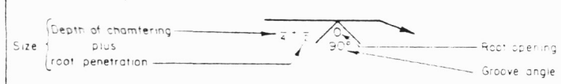
PLUG WELDING SYMBOL



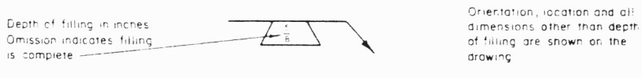
DOUBLE-FILLET WELDING SYMBOL



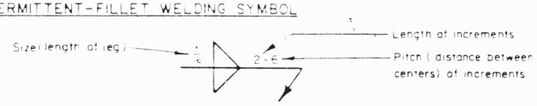
SINGLE-V GROOVE WELDING SYMBOL INDICATING ROOT PENETRATION



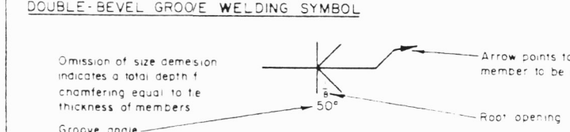
SLOT WELDING SYMBOL



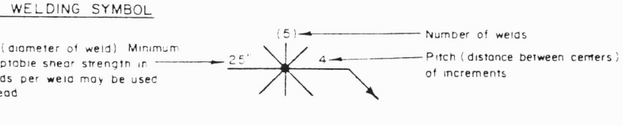
CHAIN-INTERMITTENT-FILLET WELDING SYMBOL



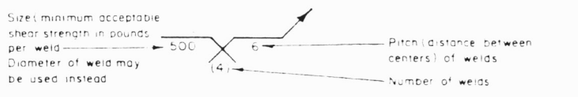
DOUBLE-BEVEL GROOVE WELDING SYMBOL



SPOT WELDING SYMBOL

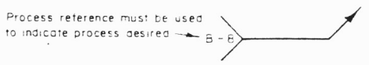


PROJECTION WELDING SYMBOL

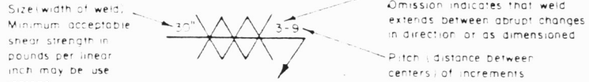


FLASH OR UPSET WELDING SYMBOL

BRAZING, FORGE, THERMIT, INDUCTION AND FLOW WELDING SYMBOL



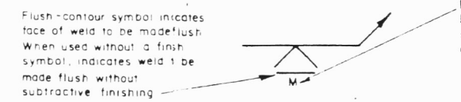
SEAM WELDING SYMBOL



Notes:

SUPPLEMENTARY SYMBOLS USED WITH TYPICAL WELDING SYMBOLS

FLUSH-CONTOUR WELDING SYMBOL



CONVEX-CONTOUR WELDING SYMBOL